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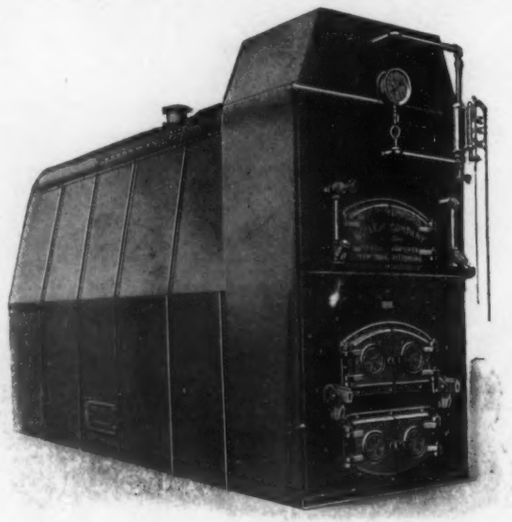

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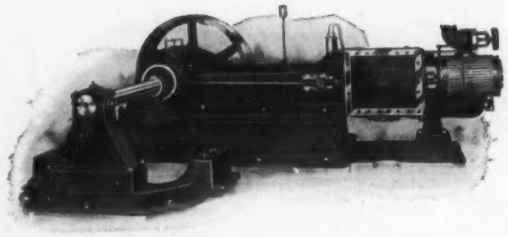

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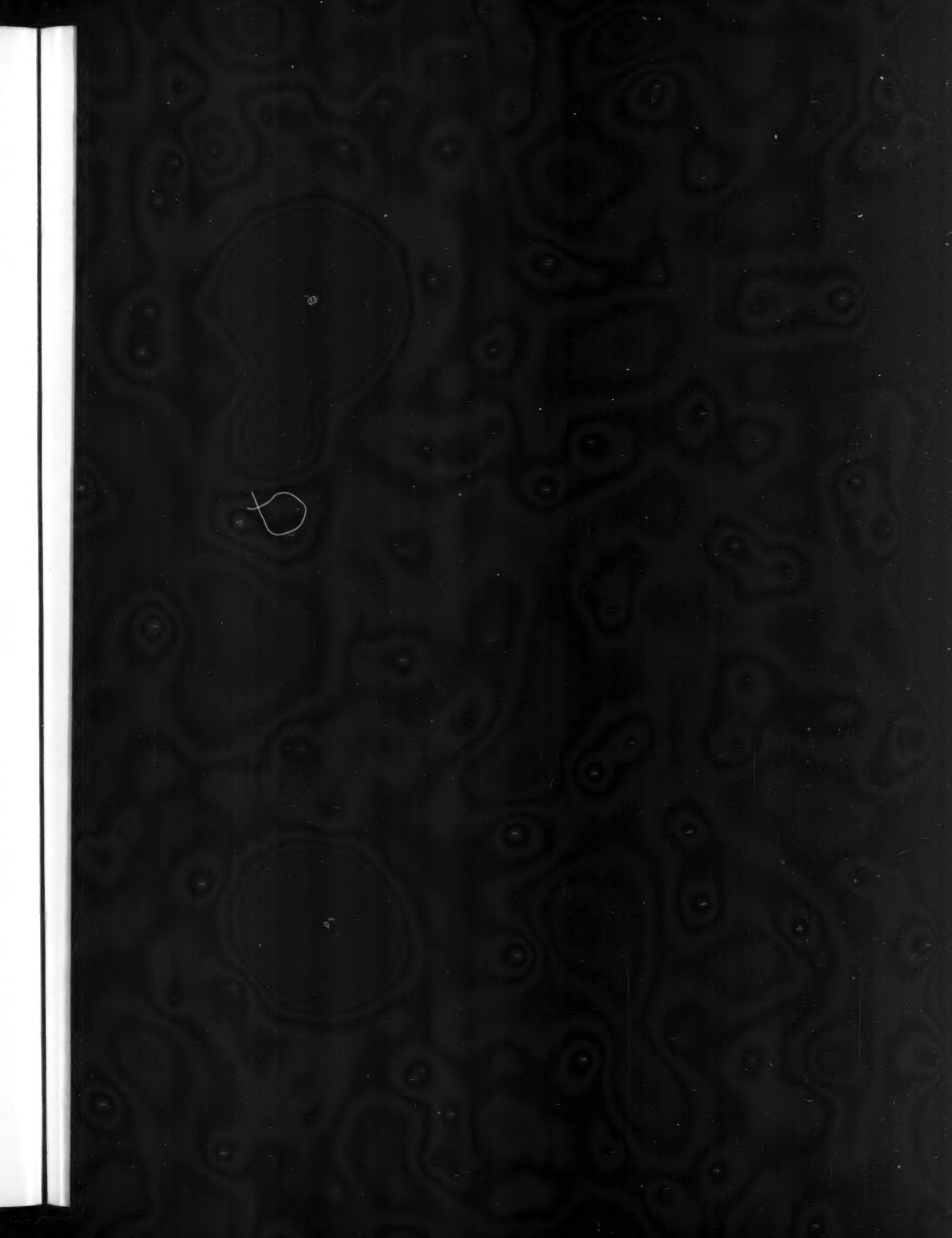

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POWER AND GAS

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VOLUME XXIII SAN FRANCISCO, OCTOBER 2, 1909 NUMBER 14

PUBLIC BENEFIT FROM WATER POWER DEVELOPMENT[1]

BY JOHN MARTIN

In the early days of California mining, the streams were utilized very generally to aid in the extraction of gold by ground sluicing, hydraulic mining and for power purposes in the development of quartz mines. During the progress of this industry the engineers were confronted with many problems in hydraulics which they were able to master satisfactorily. Owing to the climatic conditions of California with its well known wet and dry seasons, it became necessary for the mine owners to insure a continuous supply of water during the dry season, which resulted in the construction of a large number of reservoirs; the dams which impounded the water were many and of varied types, all of which are well known to the engineers of this day.

The effect of hydraulic mining, particularly in the northern portion of the State, resulted in the filling of the river beds with debris to such an extent as to threaten the agricultural interests throughout the great Sacramento and San Joaquin valleys. As the beds of these streams would rise it necessitated the construction of levees, involving the expenditure of many, many millions of dollars to protect the agricultural lands

A Modern Hydro-Electric Plant

[1]Paper read at 17th Annual Meeting Pacific Coast Gas Association, San Francisco, September 21, 23, 1909.

from inundation and finally resulted in national legislation, practicaly prohibiting this method of mining except under the most severe restrictions, involving the impounding of the debris. As a result, this industry ceased to be a factor in the State's production of wealth and left a number of these properties with their expensive hydraulic development almost valueless.

After the cessation of hydraulic mining, the companies owning these reservoirs, flumes and ditches, were able to obtain a small revenue from a limited use of some of the water for irrigation purposes, and in time, as man became more conversant with its proper application, this use became more general; particularly in the irrigation of deciduous and citrus fruit trees.

Shortly after the final cessation of hydraulic mining the development of the transmission of electrical energy for long distances was taken up very earnestly, and in some instances the hydraulic development made for mining purposes became available for this new enterprise. An impetus was also given to this industry in sections where volumes of water were available under low heads or where small amounts of water were available continuously under high heads.

On August 18, 1892, the very first alternating current power transmission plant began operation; this was at the Standard Consolidated Mine in Bodie, California, operating one 120-kilowatt single-phase generator and transmitting the current thirteen miles to the mine where a motor of similar voltage received the current to operate the mining machinery. This was the pioneer electric power transmission installation in California, and I believe in the United States. In October, 1892, a transmission line of eighteen miles and twenty-eight miles was constructed in Southern California by the San Antonio Light & Power Company to Pomona and San Bernardino, operating at 10,000 volts, and in the summer of 1893, the first plant near Redlands began its operation with one 1500-horsepower generator, transforming and transmitting at 11,000 volts to Riverside and Colton. This industry has grown until now in September, 1909, over 380,000 horsepower has been developed and is in operation in California.

There were numerous difficulties to be overcome and problems to be solved in the development and perfection of long-distance transmission, and the particular items which materially affected progress were the lack of proper insulators, transformers and motors. In the San Antonio plant in order to obtain a line pressure of 10,000 volts, it was necessary to connect twenty transformers in series, each transformer being wound to produce 500 volts, and when connected in series produced a total of 10,000 volts; a similar number of transformers were used to reduce the pressure to the operating voltage at the delivery end. These transformers were small and necessarily very inefficient. At the present time the art has progressed to such an extent that transformers are extremely efficient and are built of any size required in one unit stepping up from generator voltage as high as 75,000 volts and (when used in star connection) will produce a pressure of 130,000 volts.

The very rapid development of the induction motor which came on the market in 1895, has resulted in the production of a thoroughly suitable, reliable and efficient piece of apparatus, capable of operating 365 days in the year and twenty-four hours of each day, without any particular attention.

When the transmission of current for long distances was undertaken, the most serious problem presented was the insulation on the lines to prevent leakage and short circuits, and after many experiments, satisfactory materials, types of manufacture and construction have been produced so as to overcome the line difficulties, in so far as insulation is concerned. The necessity for high voltage in long-distance transmission was requisite to keep down the total plant cost to such a basis as to make the enterprise financially possible.

In the development and construction of hydro-electric plants there has been a large variance in the cost of the hydraulic development, in some cases making the installation unprofitable. The great initial incentive for the rapid development of hydro-electric power plants in California was due to the then existing high fuel costs; practically all of our coal for power purposes was imported from Australia and British Columbia, necessitating not only marine transportation but an import duty.

At the time of the inception of this industry, the production of oil in California was very limited. Before the true value of oil and proper methods of use were thoroughly known, the selling price in Los Angeles was as low as 25 cents per barrel, which is equivalent to $1 per ton for the very best grade of bituminous coal, and as long as prices remained so low, the incentive for hydro-electric development was removed, because the fuel costs were more than able to compete. As this price for oil meant loss to producers, it resulted in increased selling price until now the approximate selling price in Los Angeles is 75 cents per barrel, and in San Francisco $1 per barrel.

During the last few years immense tracts of timber lands have been withdrawn from entry on the part of the Government for the purpose of conserving the timber for future generations and also for conserving the waters in the streams, upon the basis that Nature's gifts belong to the people, and that national restriction alone can effect beneficial results. During the past few months considerable publicity has been given to this matter and to such an extent as to indicate to the average mind that some terrible injury has been inflicted upon the American people by developments which have taken place in hydro-electric transmission. These natural gifts can never be of service to the people until developed and the development is practically dependent upon private enterprise. If this development depended upon governmental action, it would take twenty or more years to obtain the first results. Such was the case with the irrigation projects which have shown development for the first time during the last term of President Roosevelt.

In the early eighties, Senator John T. Morgan of Alabama began the agitation in Congress for appropriations looking toward the irrigation of arid lands, and each year he would promptly annex a rider to the Appropriation Bill, which rider was as promptly shelved. His persistency and his foresight in this work finally compelled recognition, which resulted in Congressional appropriations of a revolving fund now

being used for this work. Unless this fund is materially increased, future developments will be very limited and only a tithe of the great scheme will have been accomplished in our day.

Our National Government has apparently reached the limit beyond which our statesmen will not go in making appropriations looking to the forwarding of the irrigation of arid lands, forest reserve and reforestation. If this be true, there could be no development beyond the limited amounts available from year to year as returns upon the existing expenditures, and unless private capital and enterprise takes hold the extension of this grand work will necessarily be limited.

After years of investigation of the climatological, geological and forestry conditions in the mountainous sections of California, with relation to the conservation of water, I submit that the quantity of rainfall per season is no guide to follow with relation to the minimum flow of the streams during the summer months.

The geological formations in the various watersheds alone are solely responsible for the minimum flow, except where augmented by artificial conservation.

In watersheds where numerous old river channels or lava cappings exist, the minimum flow will be very uniform each summer, irrespective of the amount of rainfall during the preceding season.

As an illustration: On the North Yuba river in the summer of 1898, the minimum flow at Bay Counties Power Company's dam was practically 250 second feet. The preceding rainy season, 1897-8, was the lowest of record for fifty years. The minimum annual flow has not varied 10 per cent during any of the succeeding years, although the rainfall has been from two or four times as great.

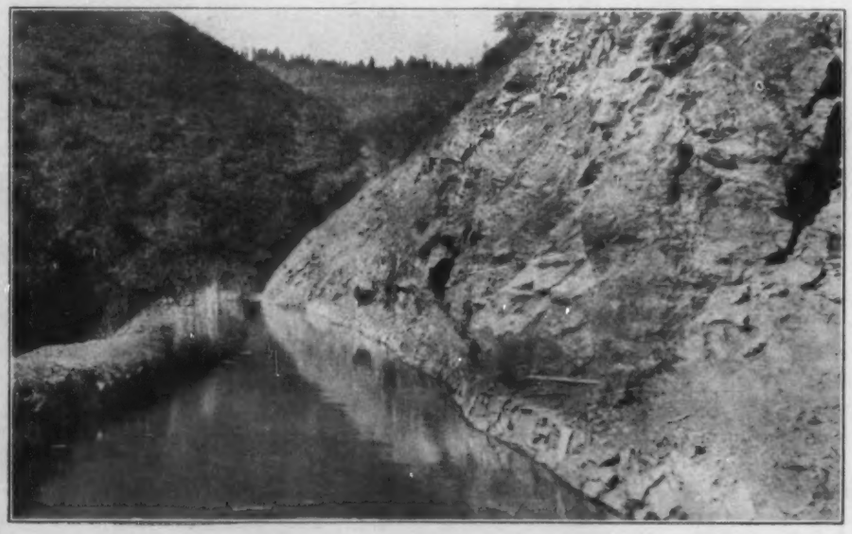
The water which is stored in this watershed in the old river channels is of approximate equal capacity annually, and when the surplus run-off ceases, this "underground storage" (as I term it) gives forth its normal quantity, except when restricted by the heating of the earth's surface during the summer, which results in evaporation to a greater or less degree; and it is this degree of variation in summer temperatures annually which affects the minimum flow in such watersheds and then only to a minor degree.

Per contra, in watersheds where few or no old river channels abound because of the massive rock formations extant throughout, the opportunities for underground storage are very restricted and the run-off is almost immediate, save for the saturation of the thin soils which cover these rock formations.

Old Hydraulic Mining Ditch

In consequence the streams reach maximum flow shortly after the commencement of precipitation (save for frozen storage due to low temperatures following the rains) and reach low periods shortly after the melting of the frozen storage. In the case of frozen storage, this is frequently eliminated during some seasons in April, May and June, due to high temperatures and warm rains. As a result, such watersheds are of little value for minimum flow during the summer months.

Timbered lands in any of these watersheds afford no water



Same Ditch Reconstructed for Power Supply

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Timbered lands in any of these watersheds afford storage available during the very dry summer months, particularly July and August, and they also furnish less opportunity for the accumulation of frozen storage in the winter.

term of supply) due to the warmth of the trees obtained from sunshine and transmitted to the ground. The only advantage of timber and vegetation is to delay the gravitation of water by preventing quick run-off, but after the rain ceases, the constant increasing temperatures with the approach of the summer months will finally melt and evaporate the moisture which is upon the ground and for some distance under the surface. The snow which is formed into ice on the barren soil will melt much more slowly and furnish a run-off for a much longer period.

On many streams it is necessary to provide from 180 to 210 days of conservation to insure uniform daily supply to the hydro-electric plant and provide for evaporation and leakage in transit. As a result of the maintenance of a continuous flow throughout the year made necessary for the successful operation of hydro-electric transmission, the waters so conserved are available and are used by the agriculturists for irrigation during the dry season and at the time when wanted, which would not be the case had not the waters been so conserved.

The many early financial failures in California of irrigation districts and companies were due to the fact that the price which the agriculturist could afford to pay for his uses did not produce revenue enough to pay the costs of operation, maintenance, interest on the cost of installation, and depreciation. This has demonstrated that conservation of the waters for irrigation purposes (except a few isolated cases) will not prove a profitable venture.

This condition is reversed, however, where the conservation is made for hydro-electric purposes and the uniform flow is made available for agricultural purposes.

Little or no credit has been given to the pioneers and capitalists who have assisted in the development of hydro-electric transmission, which is fraught with more permanent gain to the State than any similar expenditure of money in any other enterprise.

The man who purchases real estate in a city personally accumulates wealth, due to the increased value thereof, resulting from increased population and necessarily increased producing capacity of said lands when buildings are erected. As a matter of fact this citizen has done nothing toward the upbuilding of the country or in the production of its wealth, and his entire profit is realized as a result of increased population, due to the effort of other citizens in the utilization of capital for industrial and agricultural development. Among those who have made this growth possible by the application of energy, brains and capital, and the assumption of all risks, are the pioneers and developers of hydro-electric transmission. If the amount of energy, brains and capital had been applied by these people in the purchase of real estate in the large cities of the Pacific Coast since 1892, and others had been found who would have made the developments in the various lines of industry which have been made, the profits accruing from such real estate investments would undoubtedly have been tenfold more than the profits which have been made in the development of the industries that have meant so much to the increasing population and necessarily increasing wealth production on the Pacific Coast during that period. And the motives which prompt these developments are not always for financial gain only, many of the pioneers have felt greater initiative and reward in the fact that they were doing something toward the upbuilding of their State, in making two blades of grass grow where none or one grew before, than in the sense of financial gain and the comforts and pleasures that would be obtained from the use thereof; and many and numerous are the sacrifices which have been made for the benefit of the communities in which these developments were started for the purpose of assisting various new enterprises to become factors in the production of wealth. Many of these have been done at financial sacrifice and financial loss, and yet they were cheerfully done because of the sense of loyalty that was felt in the upbuilding of this great empire.

The utilization of electric current for power purposes has become general and the method of production is not at all monopolistic. Power can be and is produced alike from wood, peat, coal and oil, and the owners of hydro-electric transmission plants have to meet competition with these fuels in their respective sections; the selling price of the various commodities particularly wood and coal) are regulated by the value of labor necessary to produce same, and yet we have many fluctuations in the selling price of these commodities, due to the law of supply and demand, but the great redeeming feature in this new development is the fact that when such plants are wisely and judiciously constructed with relation to the maximum output in connection with the minimum supply of water, the installation can be considered reliable enough to warrant the making of very long term contracts at uniform prices, thereby enabling industries to insure a permanent condition of cost, as far as fuel or power is concerned. This condition does not apply to any of the fuels which heretofore have been used.

In consequence, investment in hydro-electric transmission is now looked upon as stable when properly and efficiently installed, and the investor is satisfied with a smaller return than he would obtain from his investment in timber lands, or coal mines, or oil wells, all of which necessitate not only an interest return upon the investment, but also a large annual return to replace the original capital investment, owing to the short time limit of supply exhaustion.

The National Government through its Forestry

Department is placing various restrictions upon the appropriation and use of water within the reservations. The only control which the National Government can exercise upon the waters within the State of California, is due to its right of ownership of land upon which and over which the water travels in its downward course to the ocean, and by placing the restrictions and imposing financial burdens upon the proposed use of said water, the Government is thereby increasing the cost of the power produced and placing the development of said water at a serious financial disadvantage in competition with other plants which are already installed and in operation.

As a matter of wisdom on the part of the pioneers, it is safe to assert that the most economical developments available in this State, in relation to the total cost of the plant, have already been developed or are in possession of the existing companies, and that condition of itself will tend to retard the development of other available sources to the extent of the ability of the new developments to compete with the established plants and the profits insured from the new installations must necessarily be less when entering into competition.

All water rights in California (except on public lands) are State property, and laws have been established for their appropriation and use, over which the National Government has no control.

If the plans of conservation of the waters on Government lands prohibit future development by private enterprise, the result will be the encouragement of the formation of a monopoly of the existing interests, but even this will be very remote, due to the many conflicting interests involved throughout the State of California.

The plan of procedure with relation to the utilization of water in the forest reserve for power development, will also restrict the investment of private capital, due to the limit of time for which the rights are granted.

The Department has apparently lost sight of the value resulting from private development, in that the water which is being used by the various power plants today is not absorbed or consumed, but the waters continue to flow on for man's uses equally as much as if developed specifically for those purposes.

There are many industries in this State now producing and materially assisting in the State's wealth production, which otherwise would not be a factor except for the developments which have been made in hydro-electric transmission. A notable example is the cement industry, entirely new in California within the past ten years. They are very large users of power for driving the machinery and for fuel for burning the material. Owing to the conditions existing with hydro-electric plants, these companies are able to and have made very long term contracts at uniform low prices for all their electric power, and in most cases when these contracts were made, oil was selling in their districts at from 25 cents to 40 cents per barrel, and it was in competition with oil at those prices that the owners determined the rate to be paid for its electric current supply; these prices have not been raised and cannot be raised, thereby insuring a low cost of production so far as power is concerned.

On the other hand, the price of oil today is more than double the price at which their contracts were initially made, and if they could not have made those long term contracts for current at a uniform low cost this industry would not have been financed initially, because of an absence of insurance against increased cost of production whereby their plants might become idle in competition with foreign production, which heretofore supplied the entire market.

Another very large industry might be mentioned in this connection; that is the recovery of gold by the use of dredges in lands adjacent to the streams of Northern California whereby the material is elevated from a depth in some cases of sixty to seventy feet below the surface of the ground, the material being then washed and passed over riffles to obtain the gold and return the material immediately upon the ground which had been excavated, and as a result assisting in the wealth production of this State. More than one-third of the total production of gold in California in the year 1908 was produced by these dredges.

The use of hydro-electric transmission is particularly valuable in agricultural sections, where thousands of motors are now in use in the pumping of water to the surface for irrigation which otherwise would not have been permissible.

The sources of water supply available for hydro-electric development are in the mountains of this State, and it is the aim, where possible, to obtain the use of this water under as high a head or pressure as physical conditions will permit, thereby usually minimizing the cost of development. These supplies of water are available from the ordinary flow in the streams for many months of the year, but owing to our wet and dry seasons many of the hydro-electric plants are dependent upon the conservation of the water in reservoirs where the underground storage or the melting of frozen conservation is not sufficient for a minimum flow equal to the maximum requirement of the plant during the summer months, and as a result these waters are impounded during the rainy season at a time when the conservation of this surplus water is of no disadvantage to any users below. On the other hand, by the conservation of this water in the winter and the use of same uniformly through the summer months, the various streams, particularly the Sacramento and San Joaquin rivers, have had their minimum flow augmented to such an extent as to make river transportation to many points possible, which would otherwise not be reached during the dry months of the summer by steamer, owing to the formation of bars in the streams at low water.

Without this added flow at low water, the area of agricultural production in many of the rich bottom lands of this State would be curtailed, due to restriction of transportation and irrigation facilities.

The companies operating in the forests and mountains of California have a large number of employees whose duties are to patrol, repair, and protect its properties, and as a result many incipient fires are continually being put out, which might otherwise result in the devastation of large areas of timber lands; and this is done without cost to the State or its people.

In many sections of California the entire country has been denuded (particularly in mining sections)

prior to the introduction of hydro-electric power, where such timber was used mainly for fuel purposes, and to some extent for mining timber purposes. As soon as a second growth would be large enough, this would also be destroyed for fuel purposes, resulting in almost absolute devastation. By the use of hydro-electric power during the last fifteen years, these districts are becoming covered again with a new growth, and in time will produce suitable timber for lumber purposes.

All through the mountains the patrol is continued day by day, and the surrounding country is being protected by this patrol to a much greater extent and more reliably than is being done by any other interests.

The use of electric current and power is not uniform throughout the twenty-four hours of each day, and the companies now supplying the markets have their greatest demand during what are known as the "peak" hours, beginning approximately at sunset and the succeeding four or five hours, and the minimum consumption is between the hours of midnight and 6 a. m. The consumption during the daylight hours is materially less than during the peak hours. In fact, the average output (termed load factor) of the majority of the plants will not exceed 60 per cent of the maximum (or peak) load, which is furnished by these plants during some part of the twenty-four hours of each day. Therefore, these plants have idle capacity ranging from nothing for a few minutes per day to 60 or 70 per cent of the total installation, with an average of 40 per cent of the installation which is available for sale if patrons could be obtained to use it during times when not in use by the existing demands.

There are some purposes for which this idle power can be utilized and is now being used in the furtherance of developments, similar in purpose and value to that which the Government had given its aid through its Reclamation Service. In the San Joaquin and Sacramento valleys there are numerous public plants where electric power is used for three or four months of each year in pumping water from the rivers to the uplands, and by means of small governing reservoirs and irrigation ditches these properties are beginning to become productive, where heretofore they practically produced nothing. This class of customer could use the power during the daily low periods of consumption, and by means of the governing reservoirs be able to pump from fifteen to eighteen hours per day to supply their demands and at the same time keep off the peak demands of the power plant. Such customers are able to contract for power at much lower prices than can be obtained for twenty-four-hour use or even for use during ten hours of daylight.

As this type of service only requires power for three or four months in the year, the installation of steam plants and their operation becomes prohibitive, due to the interest and depreciation charge being so great because of the limited period of use during the year. For instance, if a plant of this kind were operating for three months of the year, the fixed charges upon the steam plant would be four times as great as a plant operating twelve months of each year. In addition to this, the burden of investment becomes too great for the average farmer.

In some of the sections adjacent to the rivers where levees have been built to protect the surrounding country from inundation, large acreages have become flooded each spring with the run-off from the watershed above them, because of there being no outlet through the levees at any elevation which would permit of draining these lands.

In order to utilize these lands for agricultural purposes it becomes necessary to remove this water by pumping for a period of time ranging from two to four months prior to the planting season, and this work has been accomplished very successfully and profitably to the land owner by the use of this hydro-electric power available during the eighteen hours of low load at prices with which no other form of power could compete, and also at prices below the average obtained by the power companies. In fact, all power companies make inducements to patrons where possible to keep off the period of maximum demand each day, for by so doing the power company gets increased revenue from the same investment which otherwise would be lost.

The plan adopted by the National Government for the development of the irrigation of arid lands has placed a limit upon the total capital expenditure which can be made for this purpose, and if this same plan had been adopted in the development of hydro-electric transmission, the result would have been so very limited up to the present time as to prohibit the very large public benefits which have been obtained.

It is a fact known to every manager of the various hydro-electric transmission companies that the constant demands made upon them for increased service from old and new patrons results in a never-ending appeal to the stockholders, directors, and financial sources for additional capital necessary to cope with this constant growth.

How impossible it would be for these men to properly conduct their business without additional growth and how impossible it is in this State to avoid making additional investments for extensions and betterments, because of the legal right that patrons have to demand service.

If the policy of the National Government in relation to the development of the irrigation of arid lands were applied to the private enterprises of the hydro-electric transmission companies in California, each of these companies would be compelled to violate the laws of their State by refusing service which the law compels, because the gross income from any of these properties is not large enough to provide the necessary capital for these extensions. Practically no moneyed institution would undertake the financing of this type of quasi public property without ample provision being made to take care of the future growth.

The function of control of any project or measure by the National Government has been and should be limited in its exercise where the projects are not permissible of development by private enterprise. If it is to be the policy of this Government to control all public service, there are so many more vital and important problems to be first considered before the question of benefit or injury to a small section of the United States and a smaller percentage of its people.

No agitation is possible on the subject of irrigation or conservation of water in the Eastern or Southern States because of the absence of national ownership of public lands, and the total population possible to be

affected by the national control of conservation of water within its own domain is less than one per cent of the total population of the United States.

If all the water power available on Government land in California is developed, it would not produce an amount of power equal to the productive value of one-fourth of the annual production of the oil wells in this State.

Conclusion.—It appears to me as evident that the injuries or benefits which might affect the people of this State, due to any action of the Government in the conservation of water upon its own lands must of necessity be very small and less worthy of the time, attention, and expenditure of money than many of the larger and more important problems which affect the public at large, as much so in the State of New York or Illinois or Texas as they would in California.

It is incontrovertible that the existing developments are responsible for a very large increase in assessable property and the employment of many thousands of California's population in mines, mills, quarries, farms, railroads, etc., etc., and without these developments the State's progress would have been very seriously restricted.

We have an enormous territorial empire with very limited occupancy, and every encouragement should be given to any and all industries which will increase the opportunity for additional employment and wealth production.

The developments to which the writer of this paper has devoted his time and service during the past fourteen years and which are now owned by the Pacific Gas & Electric Company, did not involve the forest reservations in any developments which have been made.

SOME RESULTS OF PERSONAL INTERVIEWS WITH DISSATISFIED CONSUMERS.[1]

BY JOHN CLEMENTS.

The question of how to deal with dissatisfied customers is indeed a hard one. Especially is this the case with the person that registers a kick against the public service corporation, for as a rule the person we have to deal with has a predetermined verdict against us. He feels or assumes to feel that we are constantly planning how we can get the advantage of him, and as proof positive of this he will tell you of the articles he has read in the columns of the daily press, showing up our base methods. Yet when he is questioned closely as to his general belief in the truth of many statements made on other subjects by this same press, he will frankly acknowledge that he has serious doubts of many things he sees in print; that many statements are wholly in the line of agitation. Agitation is a truly American method. All, or nearly all, of our legislative enactments are the result of agitation. Many of the good things which we receive at the hands of our public servants are the result of agitation. As evidence of this, note the many so-called congresses that have been meeting throughout our country. Note the chambers of commerce, so called. Note the districts and ward improvement clubs, in every town and city, none of them have power to act. But they agitate. Often very good results come of this agitation, and many times bad results would follow if the final legislative bodies did not make a thorough analysis of their recommendations.

The effect of all this tends to make the public service corporation more watchful of their business interests. Important among other things is the treatment of the complaining consumers. It is indeed a trying task to stand every day, month in, and month out, and listen to the monotony of the complaints that are made, yet the man that has this duty to perform must be ever polite, and respectful, treating each complaint as if it was a new one, or a new sort of one.

The complaining consumer begins by telling that you have charged him (or her) for more gas, electricity, or water, than they ever used, thus assuming to put us on the defensive. Now what will we do about it? Why! We are going to investigate the complainant's claim. We are going to see if the fault lies with us. We are going to see if the meter readings have been correctly returned. If we find the readings correct we will further investigate by testing your meter if you should so desire, if the meter proves correct we will help you then to look for any fault in your installation that may be the cause of your trouble, and will advise you what best to do to reduce your bills. Many times persons have said to me: "I cannot believe that you really care anything about me or the size of my bill as long as you can get all the money out of me that you think I will stand." Supplementing this with many harsh words and impossible charges as to the methods of the public service corporations in general and this one in particular, even at times becoming personal. The representative all the while steeling himself against all this, never losing his composure, keeping a cool head and a pleasant smile. But I say: "Now, let us reason together, we have not come to you to demand anything more than is justly due. We would much prefer that your bills were smaller in amount, for then we believe you would be better satisfied. A satisfied consumer is of greater benefit to us than one who is not satisfied. The man or woman that is satisfied usually says good things of those with whom they are dealing. On the other hand, hard things are said, and no grievance lacks coloring or emphasis brought about by the state of mind of the dissatisfied person. The managers of a public service corporation are human like yourself, and like to hear good things said of their business.

"Have you ever noticed the pleasant smile of satisfaction on the face of your butcher when you have told him that the joint of meat which he sent you for your last Sunday dinner was all that you could desire, or your grocer when you have given just praise for the quality of his goods? Now the public service corporations are just as anxious, and try just as hard to please you as people in other lines of business. There is no other foundation on which they can stand and long continue in business."

I find that a reasonable person will listen with respect to your statement of the case from the standpoint of the public service corporation. Such being the case, I am fully satisfied that in extreme cases of discontent that the personal interview redounds to the

[1]Paper read before Pacific Coast Gas Association, San Francisco, September 21, 22, 23, 1909.

benefit of the corporation that follows this plan. The man or woman that comes down town to make a complaint has generally warmed up to the occasion before leaving home, and they are fully determined to have it out with the company.

This reminds me of the story told by a friend of mine, a fellow gas man. The story runs something like this: A woman that had received a gas bill a little in excess of the amount she had usually paid, determined to go down to the office of the company and show them that they could not single her out as an easy mark, for from what she had heard Mrs. S—— say that Mrs. B—— had told her the gas company was doing just this sort of thing and she was not going to stand for it, so she hastily arranged her toilet, got on the street car and came down town. Now, as she was angry when she started, she grew more and more so as she progressed. Finally she alighted from the car and looked around for the office of the gas company. This lady had always paid her bills to a collector at her own door, and being too warm to look on her bill for the address, seeing a gentleman standing on the corner she asked him where the gas company's office was. Now it happened that the man who was asked for this information was not too well acquainted in the city, but being a polite person, he said: "Madame, I think that is the place you are looking for," pointing out a handsome building with marble steps and brass hand-railing. The woman rushed up the steps and to a counter where a sign indicated Complaint Department, and began to pour out her wrath on the gentleman in attendance. "But, madame, allow me. This is not the gas company's office; this is the office of the water company." "Well, then shut off the water, I am not coming down town to pay carfare for nothing." This only illustrates that this woman, like scores of others, did not stop to investigate but would rather believe the story of someone else than to seek for the truth.

The great German author and playwright Goethe has said: "It is easier to perceive error than to find truth, for the former lies on the surface and is easily seen, while the latter lies in the depths, where few are willing to search." One day not very long since a letter was handed me by our manager. The author of the letter was evidently in a calorific state of mind. Among other things he warned us that we had this time picked out the wrong man to rob and demanded an immediate investigation; his gas bill was too high. Now the sum involved was very small, being less than two dollars for the month. Of course we would investigate. I called at this man's home and learned that he was employed in a planing mill, that he would not be home until 5 p. m. So I left word with his wife that I would call again in the evening, which I did. I found this young man, as I have found many other persons that pen harsh letters, to be a very pleasantly disposed person. Introducing myself as the representative of the gas company, I told him I had called to see if I could in any way help him out of his trouble and assured him that I was really anxious to do so. I did not in any way refer to his letter or the harsh words he had used towards us. I went over the installation and found that the young couple had a small gas range and a circulating water heater, of the ordinary type; the appliance had been in use only a short time, they were standard make, so there was no fault to be found with them. It was therefore a case of reasoning with these young people and taking an interest in their welfare. They had been told that, as there was only the two in the family, that their fuel bill should not be more than half as much as a neighbor in whose family there was double the number. "Well," I said, "let us see how this will work out. This sort of argument on its face seems quite logical, but it does not always follow that because a thing is logical that it is in every case correct.

"If you will allow me, I will illustrate, and I desire to do this in the simplest manner possible. Suppose you are preparing a meal for two, among other things you boil potatoes, the time required usually being 40 minutes. Now for two persons we will say you put in the boiler three potatoes, your neighbor having four in the family, uses six potatoes; she, like yourself, cooks them in just 40 minutes. Again, you are going to bake a dozen biscuits, enough, you will say, for two persons at a single meal. Now, you would warm up your oven say for five minutes, place the biscuits in the oven and in from 15 to 20 minutes they are ready to be placed upon the table. Now your neighbor, having four in family, bakes two dozen biscuits in just the same time that you do, and uses the same amount of fuel as you do."

Now this required a little time and patience, but proved quite convincing to this man who demanded investigation but who had not investigated for himself. However, he was fully satisfied. On my leaving the house he referred to the letter he had written to the company, and wanted me to say to our manager that he was sorry that he had not been more reasonable in his demands for investigation. This visit made a friend of a man that might have under other conditions remained an enemy and an agitator.

On another occasion I called upon a doctor who had refused to pay his bills for the good and sufficient reason that he knew he had not used as much gas as usual. In fact for the time covered by the bills in question he had not used any at all, which, if found necessary, he could prove to anyone that was willing to be honest, and listen to the truth. Now the truth is what I want to find in all such cases, for it is mighty, and will prevail. I said to this gentleman, "Let us get down to the truth; let us investigate. I have been over your account in the company's books and fail to find an error, your meters have been tested and found to be in correct registration, the last statement I have myself compared with the readings of today and it proves to be correct, so there must be some other item to be looked into. I had noticed that two months' bills were unpaid. The reason given for this was that he deemed it necessary that some adjustment be made by the gas company, as one of them was too high for the reason before given, he had not used the gas. I asked the gentleman to give me the proof that he had said he could give. At this request he smiled and said: "Now I have you in a corner. The reason I know I did not use the gas, is that I bought and had installed a coal range." I said: "So you are not using any gas? You have not used any gas for any purpose for over two months?" "Yes, we have used some gas. We have a small bedroom heater and a small plate on the coal range and you know they would not use any

such an amount as you have charged me for, so you see you have lost your case." I said: "It does look rather dark, but let us open it up again and let us have a retrial. Would you mind letting me see the bill for the coal range and the expense for installing it?" He said he would be pleased to have me see the bill, as that would be proof of dates. "But," he remarked, "the bills are at my office." "Very well," I said, "the proof of date is what I seek." You see what I wanted was to prove to him that the mistake was all his, that it was a mere matter of dates. That I believed he would find that he did not have the coal range during the time covered by the bill which he had refuesd to pay. I gave the gentleman my address and telephone number and asked him to call me up as soon as he had found the bills relating to the coal range, etc., and that I would be pleased to call again. He never called me up, but a check came in a few days for his account in full. I met him several months afterwards on a street car. He recognized me and laughingly said he was all wrong about the date of the installation of that coal range. "And another thing I want to tell you, is that I have a better opinion of the gas company since you called on me and took so much pains to clear the matter up."

Another case among many others was with a college professor. Now, when you call on a scientific man, if you are like me you will feel a little embarrassed, especially if he has refused to pay his gas bill for very good and sufficient reasons, which he tells you through the medium of a very sarcastic and very firm letter. The good and sufficient reasons are that he knows that the company is taking undue advantage of him, explaining that he knew it was impossible for two persons to use the number of cubic feet of gas with which we had charged him.

When I called on this gentleman it was in the evening and, by the way, it was an evening in the rainy season. Handing my card to a son of Nippon, I was ushered into the sitting room or den, as these great scholars call it. It was a very pretty home of the bungalow type, a nice modern gas grate was burning in the room where I was seated, and through the portieres in another room I could see gas grate number two burning. In addition to these I afterwards found a standard make of gas range and a water heater. A good customer, you would say, and so would I. In a short time the professor came into the room, when I made known to him that I had come in answer to his letter of complaint. He laughed and said that "I suppose you fellows in the office, knowing that it is near annual dividend time, are trying to make as good a showing as possible. At least it would seem so, as I find there is a general complaint of excessive bills. Much higher than they were a month or two ago." I said: "My dear sir, I hope you will pardon me if I do not make any answer to your little joke, for I surely cannot but regard such a statement as a joke."

I then went on and told him that we had made a thorough investigation of his account, had tested his meters, followed up the meter statement and verified them. I then called his attention to that portion of his letter in which he said he was satisfied that two persons could not use any such an amount of gas as we had charged him with. To prove that he was sound in the position he took in this matter, I asked him to allow me to submit a simple problem. "Suppose that you and I, or any other two persons enter this room at say 7:30 a. m. We feel chilly, we consult the thermometer and find the temperature to be say 20 degrees F. Now in order to make the room comfortable we must raise the temperature say 30 degrees. How much gas or any other fuel should it take to do this for two persons than, we will say, for six persons? The answer to this problem answers your letter. Then to go a little further with this simple problem, we desire to maintain this 50 degrees, we must admit that the greater the number of persons in the room the less actual fuel will be required. I may go into your kitchen and apply the same rule there." He said: "But what would you advise me to do in order to reduce my bills?" I answered this by asking the question if he thought that if he should use coal or wood in each of the places where he was then using gas that his bills for fuel would be any less. He was frank in answering that he did not think they would. "Now, then," I said, "as to my recommendation, I should say that if you exercise watchfulness and care, you may be able to reduce the cost. A gas fire is one that you can control much better than any other when you have the desired temperature in your rooms. You can cut down the flame so that the maximum heat may be maintained at the minimum of cost. In the kitchen when water has been brought to the boiling point, or the heat in the oven has reached the desired point for baking, you can control this in the same manner. A little close attention to these points and the operator will soon become really skillful not only in doing good work, but in the matter of cost for same, and, as you no doubt check up all other items of cost in your household affairs, I should say read your meters, check them with the statements rendered by the company, here is a card which will give you full information on this point. We shall be pleased to do at any and all times whatever we can to satisfy you to the fullest extent of our ability." This gentleman was profuse in his thanks for the visit, and the interest taken by the manager of the company on his behalf.

I might go on and give many other instances of a similar character, but this would make this paper too long. Enough, I think, has been said to show that in many instances a personal interview redounds to the best interest of the public service corporation. There is many a man or woman that appreciates a little personal attention, and after receiving such becomes our friend instead of our foe. A visit to the complaint window is often very unsatisfactory, notwithstanding the fact that the man or woman in attendance upon that department are Chesterfields in manner, the party has come in with the determination to see the chief (as they often express it). This cannot always be done, for many good and sufficient reasons, and because of this and the fact that others are in waiting, they leave the window without getting what they deem satisfaction.

The California State Mining Bureau has just issued a new map of Madera County, showing the boundaries of the National Forests in that county. This map is similar to those already issued under the direction of State Mineralogist Aubury, of the different mining counties and in which great care has been exercised to properly define the National Forest boundaries.

SOME NOTES ON NAPTHALENE CONDITIONS IN CALIFORNIA.[1]

BY SHERWOOD GROVER.

After starting to tabulate this data, I found that the records from which I had expected to obtain the information had, up until recently been kept in such a way that it would involve a greater amount of digging up than I at first anticipated, with the result that the limited time did not allow going into the matter as fully as first intended.

It was not the intention of this short article to deal with the special properties of napthalene which have been so often discussed in various papers. I will simply refer the reader to "Proceedings of Pacific Coast Gas Association," Volume 6, pages 234-235-236 and also pages 257 to 259, where the peculiarities and special attributes of this compound are thoroughly discussed both from the standpoint of the chemist and the gas engineer. The following is a quotation from paper by Mr. E. C. Jones, entitled "The Effects of High Pressure Upon Illuminating Gas" in Volume 1 of the "Proceedings of American Gas Institute": "To enrich this compressed gas, it is not necessary to scrub it with compression liquor. It is required only that the gas should pass over the surface of the liquor. The writer uses in connection with all high pressure system under his care a simple re-enriching tank through which all the compressed gas finally passes before going into the main pipe. This is called an auto-enricher on account of its simplicity and self operation." This quotation contains the key to the observations which follow.

The notes which have been obtained have been plotted graphically so that comparisons can be made in the easiest manner. This data was all obtained from three different gas distribution systems, and the curves corresponding to respective plants, are Nos. 1, 2 and 3, No. 1 being the largest plant and No. 3 the smallest, and their respective daily output being to each other about as 10, 2 and 1. Each of the systems are combinations of high and low pressure distribution, and they all have three different kinds of service, namely, low pressure direct, low pressure fed by district regulators from high pressure mains and direct high pressure with individual regulators. All of the systems have compression tanks of the same size for storage, although varying in number. The methods of operating the different systems vary, however.

In system number one there are several different high pressure lines feeding as many localities distant from the works, each of these high pressure feeders having district governors feeding off into the low pressure system at various intervals in its length. The pressure carried on this system is at this season of the year 20 pounds, except for a period of two hours during the evening peak, when 25 pounds is maintained. During the winter months the peak pressure is carried five pounds higher than this, but one feature in this system, which differs from the other two, might be noticed. The compressors are shut down immediately before midnight and the compression tanks maintain the pressure as long as their capacity lasts, after which ordinary holder pressure is maintained. In other words, for a period of approximately four hours this entire distribution system is under low pressure.

In system number two there is but one high pressure line feeding a territory some distance from the works but having several regulators feeding off into the low pressure system at intervals in between. In the operation of this system a pressure varying between eight and twenty pounds is maintained at different periods during the day depending upon the peak load, and at night a constant pressure of two pounds is maintained on the high pressure system.

In system No. 3 there is an equivalent of two high pressure lines starting from the works feeding a territory distant from the works, but on this main a pressure varying between 20 and 35 pounds is maintained. At no time during the 24 hours does the pressure fall below 20 pounds.

In system No. 1 all of the gas passes through one compression tank or autoenricher, above referred to, there being no means of by-passing this tank.

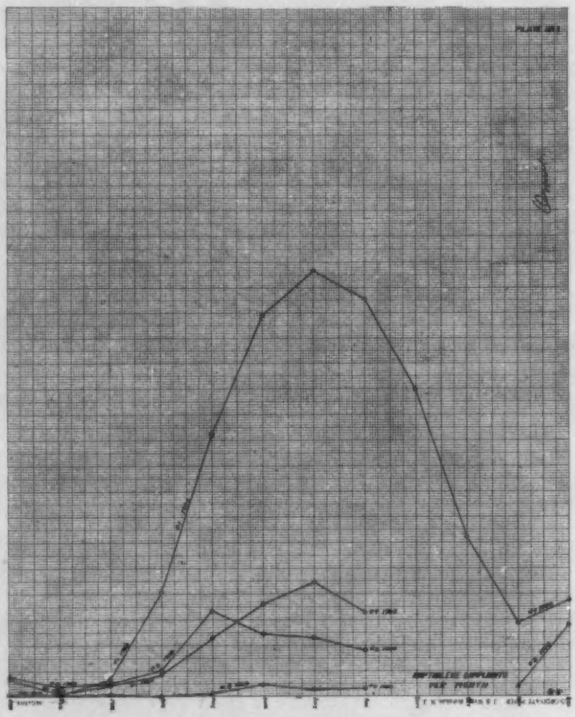

Fig. 1.

In systems No. 2 and 3 it is possible by means of connections, in place, to by-pass this tank and pump direct into the high pressure main from the compressor.

As to the napthalene complaints. In system No. 1 the records show that they have no napthalene complaints in district supplied by high pressure gas, either supplied direct by individual regulators or in low pressure territory fed by district governors from high pressure mains.

In system No. 2 they have no napthalene complaints in the district under low pressure which is supplied with high pressure gas through district governors. Practically all of their complaints are in the direct low pressure district, the same as in system No. 1, however, they do have occasional complaints

[1] Paper read before Pacific Coast Gas Association, San Francisco, Sept. 21, 22, 23, 1909.

of napthalene in the district which is distinctively high pressure fed by individual regulators, and in these cases the complaint man usually reports the presence of a thick, dark, mostly black liquid, in fact sometimes nothing is taken out but the dark liquid from which the napthalene crystalizes out on exposure to the air.

In system No. 3, the condition is somewhat similar to No. 2, except that the stoppages of napthalene in the distinctly high pressure district is much more pronounced, and in fact has been so bad that it has plugged 2-inch mains solid. The main difference in the installation between case No. 1, where we have no napthalene stoppages in any districts supplied by high pressure gas, and cases No. 2 and 3, where they do have napthalene stoppages in the distinctly high pressure districts, is the fact that the latter two are equipped so that the compressors can pump into the main without passing through the autoenricher, in fact in case No. 3 the compressors discharging into a 10-inch main which is about 50 feet long, and there reduces to a 3-inch. This length of pipe, when the compressors are pumping direct into the main would act as a first-class trap for collecting benzol and the napthalene, which would be thrown down, the napthalene of course dissolving with readiness in the benzol. This condensation would accumulate at this point until the condition was right for the gas to force this liquid solution of napthalene out into the main itself. As this liquid travels along the main, it is passing from a condition of higher pressure to lower pressure, and the ability of the gas under these conditions to re-enrich itself with benzol, could have but one ultimate effect — the recrystalization of the napthalene from its solution with benzol.

In Fig. 1 the actual number of napthalene complaints have been plotted according to a given unit of the three different systems for each month. This forms a means of comparison if you keep in mind the relative sizes of the plants above mentioned, otherwise it means nothing except to show considerable improvements in system No. 1 between the years 1908 and 1909.

In Fig. 2 the percentage of napthalene complaints in one month to total consumers affords a means of comparison on a fair basis, but will be of more value, after another year with the present method of keeping records has passed, as a means of obtaining information.

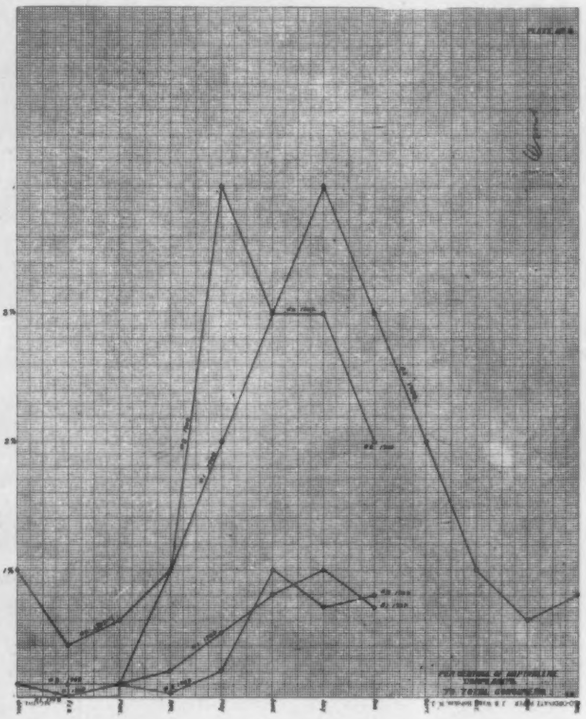

Fig. 2.

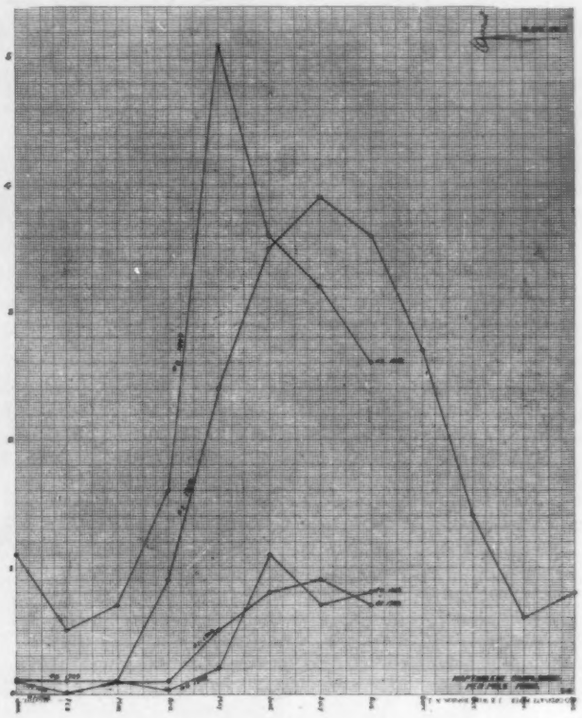

Fig. 3.

Fig. 3 would appear to me to be a fair method of making comparisons, although the nature of the curves are in a measure similar to those on plate No. 2, a slight variation, however, being worthy of note.

ELECTRIC STREET-CAR LINES OF BERLIN.

Consul-General A. M. Thackara furnishes the following information concerning fares, transfers and street repairs on the electric street-car lines of Berlin: The minimum fare on any electric street railway in Berlin is 10 pfennigs (2.38 cents) for part or all of the distance covered by the particular line. This is the fare on by far the greater number of the lines, the more exceptional higher fares being 3.57 and 4.76 cents. Even on the lines where the higher fares are asked one may ride a specified part of the total distance of the line for 2.38 cents. The maximum distance a passenger can ride for a fare of 10 pfennigs (2.38 cents) is 13.20 miles; for a fare of 3.57 cents, there is a longer maximum distance; and for a fare of 4.76 cents, 19 miles.

The radius of the service from the central point, Potsdamer-Platz, is 6.8 miles. The service is farthest extended in the direction of Tegel to the northwest of Berlin proper. Transfers are given out only on the Berlin-Charlottenburg lines

THE PUBLIC'S COMPLAINTS.[1]

BY CHARLES L. BARRETT.

Whatever may be the concrete attitude or state of mind of the public toward the lighting company concerning the legitimacy of its methods, the personnel of the company from its president to its most humble employe, rests secure in the knowledge of the fact that the correct measurement of its product when sold to the consumer is as absolute as can be determined by human means, and in this fact lies the keynote of the uniformly successful argument of its adjuster of supposed overcharges. As a matter of fact, there is no business so paternally cared for at the present moment by the state and municipal authorities as is the sale of gas, the registration of the meter is guaranteed to the consumer by his simply making the request for an examination and test by the municipal officer appointed for the purpose and the payment of a trifling fee, which fee is repaid him together with awarded overcharges covering a certain period of time, provided the meter is found to be registering in the company's favor. The matter of purity and candle power, otherwise quality of the product, has always been provided for in the laws governing gas companies, and of late years municipalities have further incorporated the regulation of price and the requirement of heat units, so it may be said without fear of contradiction that there is no business known so censored in the sale of its goods as is ours, all of which is eminently proper and nowhere welcomed more warmly than by the gas companies' officers who have to discuss with the public the vagaries of bill fluctuation. Dishonest dealers in almost any of the daily necessities and commodities of life can, if so minded, adjust their measures and adulterate their products or change the price per unit of quantity sold, to suit their fancy and with little fear of detection. Not so the lighting company.

Of all the recurring monthly household indebtedness the world over, that for gas seems to be to the classes of people who form about 40 per cent of the mass, namely, the careless, the improvident and the unreasoning, a perennial enigma, and this is so from the fact of the daily, momentary, use of trifling quantities of a commodity so intimately connected with daily life that its use becomes absolutely unnoticed or forgotten, until finally when the bill is presented these minute quantities which have been insidiously piled up daily and independently by the many different members of the household, cause the bill payer of the classes mentioned much genuine surprise. The other 60 per cent of the community, the careful, the watchful, the provident, the reasoning, the reasonable and meter reading classes, never visit the gas company's office except at the commencement and termination of their supply.

High bill complaints would seem to the layman extremely diversified in detail, but they really are not. The apparent diversity lies in the viewpoint of the consumer and his presentation of the facts. The ultimate remedy is the same in all cases, the meter test made with the standard prover, done if possible in the presence of the consumer. If not, just as carefully as if he were present; the plan of his being present, however, is always suggested and sometimes insisted upon, or the test not made. Very often effective dealing with cases of high bill consists in merely proving the prior statement reading by one subsequently taken, or by the visit of a trained inspector who should be a good mechanic and a man of pleasing personality who understands himself and the situation thoroughly.

As the whole matter is really one of fancied error rather than real, the action of this man more often determines the mind of the consumer for satisfaction than even the meter test method, and as it is a more economical plan of disposing of the question it is cultivated as far as possible. The report form adopted by the San Francisco company to be used by its special gas inspector for this class of investigation, which the inspector fills out as he makes his examination and during which he is accompanied by the consumer if possible, is turned in to the adjusting office and a letter detailing the determined facts invariably sent. The matter upon this form, which may be of interest, is as follows:

SAN FRANCISCO GAS & ELECTRIC COMPANY.
Special Investigation Blank.
GAS.

Name .....
Address .....
By whom ordered .....Date ordered .....
Condition of meter .....
Test-out at premises.....

(Determined as a rule by test upon gas appliance burners in conjunction with pressure gauge.)

Statement of meter .....Number of Meter.....
If leakage, state location and amount.....
What is gas used for; number of Welsbach burners; number of other burners; specify gas appliances.....
Is there a coal range or grate in premises.....
Is pressure good.....
Is service clear .....
Name of person seen at premises .....
Was consumer or his representative satisfied after explanation.....
Remarks and recommendations after investigation.....

ELECTRIC.

Statement of meter.....No. of meter.....
Number of lights used; character.....
Apparent condition .....
Remarks and recommendations after investigation.....
Date of investigation.....Signature of inspector.....

Should the investigation findings warrant, a new meter is set and a shop test made of the old one, a report of its condition being always sent to the consumer. Meters testing fast are so rare and the percentages so small and the satisfaction to the consumer so great that the company in making rebates for over-registration does not stand upon its legal rights for a computation upon the bills of the three months immediately prior to the test, but includes bills for any reasonable period, occasionally covering eight or nine months in point of time.

The foregoing described method of handling the high gas bill complaint applies in a more or less identical way to the handling of the high electric bill complaint with the exception that the official meter test is made upon the consumer's premises, preferable in his presence or that of his representative. The same care in ascertaining facts and the resultant letter of findings is always dispatched.

[1]Paper read before Pacific Coast Gas Association, San Francisco, September 21, 22, 23, 1909.

At this juncture it might be pertinent to recall to the minds of those present the unusual public clamor of gas and electric consumers during the winter of 1908 against what was thought to be poor quality of gas, low pressure and exorbitant charges on the part of the San Francisco company, and which culminated finally after great hostility upon the part of the daily press in a muchly advertised public hearing before the Artificial Lights Committee of the city's Board of Supervisors. This hearing was in itself an absurdity, for of the company's 80,000 consumers, just sixteen appeared before the committee to complain, their statements being mere generalizations based upon their personal ideas, solely.

Upon the company's part graphically charted curves of station send-out, temperature, and hours of obscured daylight were shown with the years of 1907 and 1908 arranged comparatively. The causes presented as possible ones at this hearing transpired afterward to be those given by an investigating board appointed by the Supervisors which was composed of two of the State's foremost engineers, experts upon gas and electrical matters.

The published report of this Board was so thorough and fair and educational in its nature that the company ordered some 30,000 reprints from the original type and mailed them to that number of its consumers with most gratifying results. As a matter of fact, the investigation was of the most beneficial nature to the company, proving very conclusively the statement advanced in the opening lines of this paper as to the honest methods of gas companies. The more rigid and searching an investigation may be as to false or exorbitant charges, if made by honest, intelligent investigators, the more the gas companies will court it.

One of the most interesting things developed in this investigation was the contradiction of the popular fallacy that in using gas for heating at low pressures several times the quantity would have to be used to produce the same result as gas supplied at higher pressures. Even one of the engineers who was afterward engaged in the examination in discussing the matter at the original hearing, so gave it as his opinion. This was by experiment proven to be quite in error, for as a matter of fact it was found to take 18½ per cent less gas to develop a given amount of heat at 5/10 of an inch water pressure than to attain the same result at 6.1 inches of water pressure. In other words, the consumers in the outlying districts of the city who had been complaining of little or no pressure were really saving money in their gas usage, if not in the time occupied in achieving results.

A matter that involves considerable difficulty in handling is that of the consumer whose meter has broken down and failed of registration and who has been presented with an estimated bill, calculated, for the period of non-registration, upon the usage of the newly placed meter. Human nature is the same in gas usage as in the use of other commodities, the more of it that is gotten for little money the more will be used. Consequently, when the consumer who has gotten accustomed to paying but nominal bills finally gets a true showing which also includes gas used under wasteful methods, he is somewhat shocked. In the consumer's argument for rebate upon the average charge it is wonderful how invariable is that of the absence of the whole or part of the family during the period covered by the estimation, and how promptly not only the absentees but additional friends arrive upon the scene the moment the new meter is installed. These cases of average charge are usually compromised by an allowance of greater or less amount.

Adjustments for leakage where the company is really at fault are rare, but when the fact that the company is responsible is determined, generous allowances are always made, this being one of the few instances where a basis for allowance is patent and it enables the adjuster to carry out the company's policy of solving all doubts in favor of the consumer.

Probably the most difficult complaint to adjust is that arising from the transposition of consumers' meters, this being occasionally done inadvertently by our own men, or outside gas fitters, in locations where a number of meters set together, causing erroneous bills to be rendered. If there is a wide discrepancy in the amounts used, the transposition is quickly detected, but where the usage of the consumers interested is fairly equal it may be a long time before the matter is discovered. When the consumers do ascertain the true state of affairs those who have paid more than the correct charge insist rightly upon its return, but the ones undercharged never can be made to see the justice of a bill for the difference, and almost invariably decline payment upon the ground of supposed legal rights in having receipts covering the period involved.

There has always been in San Francisco, and consequently the condition must pertain in all other cities, two classes of consumers that are oddities in their way, and although upon first acquaintance they are surprising and interesting, they became terrific nuisances as time goes on. One of these is the fire-eating anarchistic letter-writing anti-corporation crank whose creed regarding his bill, be it large or small, shows up at almost exact periods of time, indicating that he cannot stand the mental pressure a moment longer and not explode, and the other the violent monthly kicker against his bills which are as a rule of ridiculously small amount. These types are the ones who, when it is possible, air their grievances in the daily papers and who are absolutely impossible to satisfy by any treatment whatever, for in capitulating, their hobby would be destroyed, and to that no man will consent willingly.

Another type of complainant, who is to be pitied, is the poor struggling landlady who ekes out a living by renting rooms with gas for stove and lighting use furnished either gratis, or at a flat rate of small amount so as to attract or hold the sub-tenant, the result of this bad business judgment always taken advantage of by careless or unprincipled rentors is visited upon the gas company's adjusting office at more or less regular intervals.

It would seem from all the foregoing that bill trouble was all the company had to contend with and that the public had no other complaints. This would be a most happy state of affairs if true, but unfortunately it is not. San Francisco's summer foggy weather is the bane of the gas engineer, for in its immense temperature differences as between midnight and midday seems to lie the cause of the formation of the

feathery napthalene crystal which builds upon the slight protuberances in services and meters and which in the course of a short time causes the flow of gas to fail and finally cease altogether. This, together with the usual cases of condensation and leakage and the trouble incidental to overworked mains and services which all companies experience, approximates from fifty cases a day in the four or five rainy months, to from 200 to 600 cases a day during the other months of the year. While this number is but a small percentage of the San Francisco company's consumers, it makes up a troublesome complaint condition, interferes with shop management because of its variability, and gives an impression of poor service because it is so generally distributed throughout the mains system. Although the San Francisco company is blessed with the most capable engineer in the country and of whom it is said that he can even "make light of the truth," this pressure question gets so upon his nerves at times that he may be excused for occasionally using that pet ejaculation, "the public be dimmed."

After all, the poor pressure complaint is a blessing in disguise, for it is the best known local indicator of an outgrown distributing system, and upon this indication the engineering department can by enlargement of mains and services in the locality of the trouble, remedy the defect of chronic low pressure and napthalene stoppage at that point for a long period of time.

In making complaints both oral and written there is often displayed by the consumer much unconscious good nature, curious expression, ridiculous assertion and errors in spelling and diction. Herewith are a few verbatim quotations from letters which are at hand or have been received. The following on leaks, reported upon postal cards, are interesting.

S. F. Gas & Electric Co.—Gentlemen:

I wish that you would send a gas leak at your meter.

Respectfully,

MRS. P. C.

From a Chinaman:

Your man must please come fix; have bad gas breath.

Another from a Chinaman:

Please you call fix metter: heap stink.

On gas trouble the following is a gem:

S. F. Gas Co.: My gas meter is out of order; also my neighbor, Mr Schmidt. Will you please sent somebody to fix them?

Another upon the same subject from a Chinaman:

Please you call make more gas in mettle; all run out.

From a well-meaning and friendly gas fitter during the high bill investigation of last winter, written upon his billhead:

Mr. Barrett, Sec'y S. F. Gas & Electric Co.:

Your copy of A. M. Hunt and Cory, Engineers, received. My experience as a plumber has been that in working around jobbing for 19 years in this city; have found that the consumers complaint of gas bills and meters has been because men seldom know what they are kicking about. I have been in so many places where vegetables were on cooking and boiled away dry because the women folks had callers and went to the parlors and left the gas on full tilt. Other places I found that in changing pots they will go away and leave burners burning full open while they would get another vessel to put on and sometimes have to clean it, the gas burning in the meantime. I found kettles boiling over and turned these off, as I am a married man and watch these things, but even in my own house I have come home unexpected and found company in the house and gas on four burners and everything going, turned the gas off, and in half and hour some one come rushing out. No use fighting a woman, but when gas bill would come in then there would be a howl; want me to raise hell about it, and I would raise hell with them instead. I have worked for the Gas Co. in Chicago, Milwaukee, Tacoma, and for two here, and I know, as I have done much experimental work, that they try and do the right thing.

Yours very truly,

Some extracts from a copy of a letter sent by its writer to the San Francisco company, the original of which was sent to the Judge before whom this company's rate injunction proceedings were being tried:

Honored Sir:

I have paid promptly all of my gas bills at the rate established by the Board of Supervisors of the City and County of San Francisco, and this morning on the advice of counsel have sent them the difference between that rate and the dollar rate.

The newspapers said that you would take cognizance of an unconscionable rate.

While Assistant Engineer of Works at the ——— Company at Dayton, Ohio, we made representations, backed up by estimates, to the gas company there that we could build a gas plant and put the gas into the holder for $0.25 a thousand cubic feet, and the gas company knew that our estimates were correct.

The natural gas company, for it was them that we were dealing with, gave us the gas for $0.30 a thousand. This settles the cost of pumping and distributing. Add to this the $0.25 a thousand the cost in the holder and the cost of the gas delivered, amounts to $0.55 a thousand. Surely your Honor will conceed that $0.45 a thousand, or 82 per cent profit, is an unconscionable profit.

It is quite true that the San Francisco Gas & Electric Co. is not making that profit, on account of the earthquake. I have been watching the pumping of the mains ever since the time of the rate discussion and the quantity of water in the mains is fully three times what it should be. It is customary to pump the condensation from the mains, but what I have been watching has been rain water. There is no question as to the difference between gas condensation and rain water leakage. If in wet weather water leaks into the mains, in dry weather the gas leaks out. This accounts for their loss

I do not see the justice of paying the gas company for their loss due to the earthquake while others have had to sustain their losses. If their plant has been impaired by the earthquake to such an extent that the leakage explained above makes them unable to furnish gas at the rate established by the Board of Supervisors, why don't they fix their mains?

In light of the above facts, I make this protest against what seems to be an unconscionable rate and ask if there is any relief.

Yours respectfully,

P. S I am the son of the ——— that built the ——— Works and am a trained engineer both here and at Glasgow University, and am in a position to know what I am talking about.

The following from probably some odd old gentleman with time on his hands is curious:

S. F. Gas & Electric Co.:

GENTLEMEN: Did you ever read Kipling's "The Light That Failed"? Well, it's not in it with the story of the lights that fail at Whittens every night. We have eastern company and they make odious companisons between what they have and what we get. For the honor of our noble city and State, please make a showing and send a man down to pump up our gas.

I will remember you in my prayers when I say them.

Very truly.

On the back of the sheet is the following:

It is too bad, alack, alas,
The trouble we're having with the gas.
You cannot see to read or eat;
In fact, I never saw the beat.

I scarcely know just what to do,
But took a chance at writing you,
In hopes that you would surely try
To make our gas blaze way up high.

Now, Mr. Gas Man, bring your pump
And cause our light to blaze up high,
And perhaps our bill may take a jump,
But that will never make us cry.

Another from a Chinaman leaves nothing whatever to the imagination:

San Francisco Gas & Elec. Co.:

GENTLEMEN: We have been burning your gas for so many years and that usually to pay the bill from three dollars to five dollars a month with no excessive. However, the bill claims so much in the future two months. It is hardly to satisfactory. We will mail these receipts to you; kindly compare it at once whether it's righteous. Answer.

Respectfully yours,

A postal probably suggesting defective pressure:

S. F. Gas & Elec. Co.:

SIRS: Please send to ——— street one box candles or half dozen coal oil lamps, or send some one to fix gas so we can find it without the above.

It will be observed from these few quoted extracts that the usual tragedy of the gas trouble man's life is sometimes relieved by a little comedy, bringing out his normal natural cheerfulness which, if used with the disgruntled consumer, is after all the greatest alleviator of the complaint condition we have knowledge of.

IN MEMORIAM

Pacific Coast Gas Association

GEORGE PERLEY LOW.

Born December 29, 1863. Died May 23, 1909.

George Perley Low was born in Boston, Mass., December 29, 1863. At the age of five years his parents removed to Portland, Oregon, where his boyhood was spent, and here he completed his high school course. He came to San Francisco in 1883, where he was engaged for several years as a newspaper reporter, and in 1887 went to San Diego as reporter for the San Diego Union. The following year, on August 16, 1888, he was married to Miss Ettie A. Skidmore.

Electricity had always been a hobby with Mr. Low; even as a boy he had built telegraph lines, made motors, and read all of the electrical books he could get, keeping pace with the growth of the science. In 1888 he started in the electrical field in San Diego. There also for a time he was a member of the City Council. This same year he returned to San Francisco, and became the electrical expert for the Pacific Insurance Union, which position he held from 1889 to 1896, when he began the publication of the Electrical Journal, or the Journal of Electricity, Power and Gas, as it was afterwards called.

Mr. Low was an able writer, and through his efforts the success of the Journal of Electricity, Power and Gas was attained. This Journal will forever be a monument to his good work.

The electric lighting effects of the Midwinter Fair held in San Francisco in 1894 were under the charge of Mr. Low, and we all remember the brilliance of the lighting and the many novel electrical surprises which added so much to the success of the Midwinter Fair.

Mr. Low became a member of the Pacific Coast Gas Association at the tenth annual meeting held July 15, 1902, and from the first showed an interest in the affairs of the association, contributing much to its welfare, particularly in placing on record and perpetuating many interesting facts concerning the history of gas lighting in California. This work he did as historian of the association. His death is deeply regretted by his associates in the Pacific Coast Gas Association, who feel that they have lost a staunch friend and helper.

Mr. Low is survived by his widow and two children, Marian Cordelia Low and George Perley Low.

HARRISON JUDSON EDWARDS.

Born August 19, 1850. Died July 10, 1909.

Harrison Judson Edwards was born in Connecticut in 1850, and in early boyhood removed to Providence, R. I., where his school days and young manhood were spent. In 1876 he came to San Francisco, where he took a position in the Assessor's office under Alexander Badlam.

In 1878 he was married in Oakland to Miss Flora L. Brown of San Francisco. In January, 1880, he removed to San Jose. Here the best and most active years of his life were passed. Beginning as a collector for the San Jose Gas Company in 1882, he became superintendent, and he retained this position until August 8, 1889.

He assisted in organizing the Electric Improvement Company and was made its manager and secretary August 29, 1889. In 1901 the United Gas and Electric Company took over all the gas and electric interests of San Jose and vicinity and Mr. Edwards became adjuster. In March, 1904, the United Gas and Electric Company became a member of the California Gas and Electric Corporation, and in May, 1905, Mr. Edwards was made manager, which position he held until his death.

For ten years he was a member of the Park Commission, having been President of the Board to within two years of his death.

He was a former president of the Eagles and prominent member of the order of Elks and the Ancient Order of United Workmen. He took a deep interest in civic affairs, and especially in the development of Alum Rock Park, a spot which he loved devotedly. He became a member of the Pacific Coast Gas Association at its thirteenth annual meeting, held in San Francisco July 18, 1905.

Another friend has said of him in loving tribute:

"Who but the sturdiest kind of a genuine man could have fought and won the battles of the last quarter of a century during which he rose from the position of collector of the old gas company to be and to remain the local head of the greatly increased and diversified energies of that institution, in the face of persistent and intense antagonisms? Who else among us could have retained throughout the struggle a perfectly imperturbable good nature, have made friends of his antagonists, have won every battle of his life save the final one by sheer force of personal character, and have gone down to his grave at last without an enemy and with a smile on his face? Who else could have originated that delicious fiction of 'The Royal Family' round which many of the jests of his everyday intercourse with men were woven, and have ruled his subjects with an unquestioned scepter until the title of 'The King' became his by universal acceptation? Dispute however we may about the rules and proprieties of our social life, we must all agree that it took a man, a genuine man, a large-hearted and many-sided man, a King among men, to take the place and play the part in life which Harry Edwards, 'The King,' took and played successfully for the past twenty-five years in San Jose."

As to his friends, their name is legion, and they are to be found in every walk and condition of life. Every man of his acquaintance is his friend. Every man who now is or ever was in his employ is his friend; and his best friends are those who know him best."

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A transposition of illustrations and captions appeared in our issue of the 25th inst., on pages 276 and 277. The following corrections should be made: Fig. 2 should be Fig. 4; Fig. 3 should be Fig. 5; Fig. 4 should be Fig. 6; Fig. 5 should be Fig. 7; Fig. 7 should be Fig. 3.

Napthelene in the gas meter, like dirt, is only matter in the wrong place. In poles and piles it is a valuable preservative.

Wireless telegraph communication between San Francisco and Honolulu, a distance of 2100 miles was held this week by S. A. Phelps, who announced the arrival of the Oceanic Steamship Company's steamer Alameda before the news was received by cable.

The Santa Fe Railroad is equipping its freight cabooses with telephone instruments. In case of accident the trainmen can make immediate connection with telegraph wires by means of extension poles and thus notify the nearest station. In this way it is believed many accidents can be avoided.

A big merger telephone company has been effected at Spokane. The Home Telephone Company at Spokane, the Interstate Telephone Company owning a line in eastern Washington and all the Independent Telephone Companies in Montana are to be taken over by the new corporation, in which Patrick Wall of Butte and Thomas L. Greenough of Missoula are interested.

In the course of his address at Spokane this week President Taft referred to the wonderful work of Gifford Pinchot, which, though it at first brought denunciation, is now recognized as of immediate necessity. He declared that Secretary Ballinger's ideas are in strict accord with those of the administration and that he has been of great assistance in securing Congressional action that will put the Roosevelt policy of conservation upon a finer basis. By thus "pouring oil under the troubled waters of this tempest in a teapot" the Chief Executive is proving his worth as a diplomat.

Professor Novak of Austria, recently made several improvements that reduces the friction in centrifugal pumps and turbines. Tests of machines built under these specifications have shown such a high efficiency that our readers will be interested in an article in this issue by O. C. Goeriz, in which he explains and discusses the principals of the Novak revolving diffuser. Attention is invited not only to the unique and interesting design and its high efficiency, but also to the comments bearing upon the selection of turbine pumps versus volute pumps. Installation of pumps for house use, fire service, boiler feed and high lift in general should offer a large field of usefulness to this invention,

Improved Boiler Efficiency

There can be no question but what the next few years will witness a great improvement in boiler efficiency corresponding to a like increase in the output of prime movers. Many experimenters, prominent among those being the fuel testing department of the United States Geological Survey, are putting to practical test the various theories proposed. Of these theories, the most interesting

is that advanced early this year by John T. Nicholson, professor of mechanical engineering in the university of Manchester, England, wherein he finds that a thin film of gas on the surface of the boiler is the agent that opposes the transference of heat from the hot furnace gases to the water within. Any scouring action, such as that due to a high velocity of gases, should remove this film and consequently increase the rate of heat conductivity.

The nearest counterpart in present use to this scouring action, is that exhibited in the locomotive multitubular boiler. If some means could be devised whereby the heating surface of this type could be increased, it would approach the ideal conditions demanded by the theory. Before success can be obtained, however, the many practical objections to the difficulties of cleaning and of the danger of incomplete combustion are to be met. Meanwhile its suggestion is of value.

A New Department

The discovery of vast deposits of iron ore in Southern California, the building of a steel refinery at Irondale, Washington, and the successful smelting of iron ore in the electric furnace at Heroult in Shasta County, California, are but straws to the weather wise. The metal industry in general, and the iron market in particular, has long been regarded as a barometer of trade conditions. Its rise and fall has usually presaged a similar fluctuation in almost every other line of human activity. The reason for this is that iron is the essential basis of modern civilization. Its universality of application was wittily epitomized by Hood when he said, "from the gigantic steamer which crosses the Atlantic to the smallest of ornamental shirt buttons, this metal has become so prevalent that the country ought to be ticketed, like a laundress' window with 'Ironing done here.'" The magnetic properties alone of iron make it of incalculable value to the electrical industry, so it has indeed become the "touchstone of civilzation."

Notwithstanding augmented production of pig iron which has surpassed all previous records with a gross monthly output of over one and one-half million tons, the supply is not equal to the demand. The steel mills throughout the country are congested with work and few of them can make shipments under ninety days from receipt of specifications. Prices are increasing so that importation is again becoming possible. On the Pacific Coast one of the steamship companies recently purchased fifty thousand tons of Chinese pig iron, which together with the German production, is becoming an important factor in the local market.

Because of the intimate relations borne by iron to the production of power, whether steam, gas or electric, it seems fitting that this journal take cognizance of the rise of this great industry in its chosen field, the Pacific Coast. Elsewhere in this issue is inaugurated a new department, the Pacific Metal Worker, which should be of interest to all our readers.

Corporation Baiting

Corporation baiting has become almost as prevalent in this country as bull-fighting in Mexico. The sensational press is assiduously endeavoring to fan into a flame of resentment a latent spark of public sentiment antagonistic to public service corporations. There is no serious student of economics but will admit that there are certain faults inherent in present corporation methods. Of the various remedies proposed to correct these faults, governmental regulation is perhaps the most advisable and governmental ownership the most injudicious. In line with the policy of certain self-interested individuals to foist upon the city of San Francisco a municipal street railway the daily press is giving much publicity to an adverse criticism of the system of the United Railroads by Professor Charles Zueblin of the University of Chicago. Coupled with a merited commendation of the Key Route system in Oakland he states that "the United Railroads system is one of the worst in the world, and shows that there is incompetency at the head of it." What selfish motives prompts this vicious attack we do not know, but it is certainly as unfair as are the unfounded charges of untruthfulness now being made against Dr. Cook by Commander Peary regarding the discovery of the North Pole. With rapid transit, low fares and a generous transfer system the people of San Francisco are enjoying an excellent service. This company, like all other public utility corporations in the community, is still handicapped by the enormous expense required to reconstruct its lines and plants after the disaster of 1906. The most pressing needs of the system were met at once and the minor defects are now being remedied as rapidly as time and money permit. Malicious assaults can in nowise hasten the contemplated improvements.

The professor does not confine his remarks to destructive criticism, but supplements them by an endorsement of the project of a municipal street rail way. The absurdity of this proposal is so manifest as to call for little comment. The fact that it is welcomed by the political "hangers-on" is in itself significant.

A similar campaign is being waged against the lighting companies with the question of reduced rates as ammunition. The contention is raised that the valuation upon which to allow investment returns should be limited to the cost of installing a new plant that will give equivalent service. This does not take into consideration the rapid growth of the community and the necessity of supplying extensions to care for future needs. Unless rates allow for the depreciation of apparatus, a great injustice is done to the company. Many people also do not realize that it costs more to furnish electric current to residences than it does to supply the power needs of a manufacturer. There is, however, one general complaint being urged against many corporations, that of over-capitalization. It is here that governmental supervision will prove most effective in guarding the interest of the people.

PERSONALS.

R. W. Van Valkenburgh, credit manager of the Western Electric Co., is in San Francisco.

Norwood Brockett, secretary of the Northwest Electric Light & Power Association is in Los Angeles.

Douglas Belts has been appointed manager for the Interstate Telephone Co. at Pilot Rock, Oregon.

A. M. Hunt, consulting engineer, San Francisco, has returned from a short business trip in the mountains.

E. G. Dewald, Pacific Coast representative of the hydraulic turbine department of the Allis-Chalmers Co., is now in San Francisco.

C. S. Cook, manager of the railway and lighting department of the Westinghouse Electric Manufacturing Co., left San Francisco last week.

P. M. Lincoln, of the engineering department of the Westinghouse Electric Manufacturing Co., started on his return trip to East Pittsburg, Pa.

Chas. F. Scott, consulting engineer of the Westinghouse Electric Manufacturing Co., has left San Francisco for the home office at East Pittsburg, Pa.

W. A. Blair has resigned as treasurer of the Western Electric Company's San Francisco office to become treasurer for the Pacific States Electric Co.

G. J. Barry, sales manager of the railway department of the General Electric Co., Schenectady, N. Y., spent a few days in San Francisco this week.

Homer Hamlin, City Engineer of Los Angeles, Cal., has been appointed Engineer in Charge of Harbor Improvements by the Board of Public Works of that city.

S. L. Prenter has been appointed assistant to F. R. Glover, assistant general manager of the British Columbia electric railway at Vancouver, B. C., and will have special charge of the Chilliwack division of the system.

W. G. Bardens has been appointed engineer in charge of the construction and operating department of the Electric Storage Battery Co. for the Pacific Coast, vice G. R. Murphy, resigned. Mr. Bardens has been associated with the laboratory and construction department of this company for several years, having been in the San Francisco office for the past three years.

H. Hobart Porter, member of the firm of Sanderson & Porter, is now in San Francisco. He is making an extended trip, having just come from the Northwest, where, with Wynn Meredith and R. S. Buck, also members of the firm, he has been looking over their various interests in that territory. After making a trip over the Stanislaus power plant, Mr. Porter will return to New York.

The many friends of George R. Murphy will be interested in knowing that he has resigned his position as engineer of the Electric Storage Battery Co., to join the well known firm of Pierson, Roeding & Co. of San Francisco. While this change will not be made immediately, it is understood that it will take place in the near future. Mr. Murphy has been long and favorably known on the Coast among lighting and railway officials, as his engineering work has brought him into direct contact with most of the public service properties. He is equipped with a thorough knowledge not only of construction in his special line, but of the maintenance requirements of the properties whose operating details have been his particular study. Mr. Murphy was graduated as electrical engineer from the School of Mines, Columbia University in 1899. He was engaged for a time with the Metropolitan Street Railway, New York City on power station construction and operation, and for three years was associated with the Electric Storage Battery Company as operating department engineer of their New York office. In 1903 he was transferred to San Francisco as engineer in charge of construction and operating department for the Pacific Coast. During his six years on the Coast, Mr. Murphy has become very well known among the engineering fraternity, his prominence in his profession having been recognized first by election as secretary of the San Francisco Section of the American Institute of Electrical Engineers, and more recently as Chairman of the same body, which position he still holds. Mr. Murphy will necessarily have a wider scope in his association with Pierson, Roeding & Co., owing to the more varied nature of their work, and he will bring to them an ability which will no doubt be of great value in the various engineering problems that constantly confront the firm in the rapidly developing field of power and traction on the Pacific Coast.

DENVER CONVENTION AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.

A number of delegates to the convention of the American Street and Interurban Railway Association from California will leave San Francisco Saturday, October 2d, on the Overland Limited. Considerable enthusiasm has been displayed by the Street Railway officials and others interested in the allied body, the American Street and Interurban Railway Manufacturers' Association, and California will send a large delegation. Quite a number of those intending to be in Denver have combined the convention with an Eastern trip. Among those leaving on Saturday are: Chas. N. Black, vice-president and general manager United Railroads of San Francisco; A. H. Babcock, electrical engineer, Southern Pacific Co.; C. H. Robertson, superintendent East Shore and Suburban Railway Co.; H. H. Oellig, master mechanic Petaluma & Santa Rosa Railway Co.; W. H. P. Hill, general manager Monterey & Pacific Grove Railway Co.; Richard B. Carr, sales manager Carnegie Steel Co.; J. C. Liggett, sales manager Ohmer Register Co.; L. Heyneman, Coast manager for the Goldschmidt Thermit Co.; James C. H. Ferguson, sales agent Midvale Steel Co.; A. V. Thompson and A. W. Arlin of the General Electric Co.; Carl Heise and Geo. Noble of the Westinghouse Electric & Mfg. Co.; S. K. Colby, vice president Pierson, Roeding & Co., and Frank Bodler of the Eccles & Smith Co.

As this is the second time a convention of this organization has ever been held west of the Mississippi, the Pacific Coast has been very enthusiastic in helping along the attendance. Special cars will leave from Seattle, Portland and Los Angeles, reaching Denver about the time the San Francisco delegation will arrive.

SEVENTH ANNUAL MEETING OF REJUVENATED SONS OF JOVE.

The seventh annual meeting of the Rejuvenated Sons of Jove will be held in Cleveland, Ohio, on October 14-15, 1909, with headquarters at the Hollenden Hotel. According to the old Grecian mythology on which the ritual of the order is built up, the 15th day of October in each year was sacred to the King of the Gods, and was called by his name—Jupiter's Day. Mr. J. Robert Crouse, No. 260, of Cleveland, Ohio, is the Reigning Jupiter of the Sons of Jove, and has decreed that the convention be concentrated so far as possible into the one day, October 15th.

Meetings of the standing committees will be held on October 14th and a reception to visiting Jovians will be given at the Hollenden Hotel on the evening of the 14th. On Jupiter's Day, the business session will be held in the morning; in the afternoon a class of one hundred or more initiates will be led from darkness into light. The Jovlation in the evening will consist of a dinner and vaudeville entertainment in charge of H. H. Cudmore and H. C. Rice of Cleveland. Over five hundred new members have been added during the year, making a total membership of about twenty-five hundred.

THE PACIFIC METAL WORKER

A Department Published in the Interests of The Pacific Coast Metal Industries

EDITED BY HARRY F. DAVIS

THE UNITED METAL TRADES ASSOCIATION
of the Pacific Coast.

President, O. E. HEINTZ
Pacific Iron Works
Portland, Oregon.

First Vice-President, GILBERT HUNT
Gilbert Hunt Company
Walla Walla, Washington.

Second Vice-President, GEORGE JAMES
Variety Iron Works
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Third Vice-President, NIVEN McCONNELL
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Secretary-Treasurer, A. F. SMITH
Smith & Watson Iron Works
Portland, Oregon

Commissioner, H. S. HASTINGS
319 Pioneer Bldg. Seattle, Washington. 222-3-4-5 Commercial Club Bldg. Portland, Oregon.

CALIFORNIA METAL TRADES ASSOCIATION

President, J. M. ROBINSON
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San Francisco, California

First Vice-President, JOSEPH J. TYNAN
Union Iron Works
San Francisco, California

Second Vice-President, JAMES W. KERR
Steiger & Kerr Stove and Foundry Company
San Francisco, California

General Secretary, HARRY F. DAVIS
905 Hooker & Lent Bldg., 503 Market Street,
San Francisco, California

FOUNDERS' AND EMPLOYERS' ASSOCIATION
of Los Angeles

President, FRED L. BAKER
Baker Iron Works
Los Angeles, California.

Vice-President, R. LIVINGSTONE
Keystone Iron Works
Los Angeles, California.

Secretary, W. B. HOSWELL
211 Bryson Bldg.,
Los Angeles, California.

EDITOR'S ANNOUNCEMENT.

I had planned to put to press, just two years ago next month, the initial issue of *The Pacific Metal Worker* as a monthly technical journal, devoted exclusively to the metal trades industry on the Pacific Coast. This plan was nipped in the bud by the financial flurry and following depression.

From interviews had at that time with prominent metal trades operators in Seattle, Portland, San Francisco and Los Angeles, I soon realized the arduousness of the undertaking. Several almost insurmountable obstacles had to be overcome before one could reasonably hope to attain even moderate success in the publication of a Pacific Coast metal trades paper as a monthly journal; first, the greater portion of the news matter would be stale before it reached the readers, and secondly, I had no *bona fide* circulation to offer advertisers.

In spite of these drawbacks, I did succeed in enlisting the moral and financial support of those standing at the head of the metal industries on the Coast. This fact I then interpreted, and have since learned that I was right in so doing, as an indication of the eagerness on their part to have a publication laboring in the interests of the industry, one which would quicken its pulse and stimulate all the arteries of the trade, even feebly as must needs have been the efforts of *The Pacific Metal Worker* in this direction had it been published but once a month, as originally planned.

At that time, too, I had hoped through the medium of *The Pacific Metal Worker* as an independent publication advocating the labor policy of no one city, but representative of all, to unify the entire metal trades industry of the Coast on the *man* problem. As a radical departure from this proposed program, *The Pacific Metal Worker* Department of the *Journal of Electricity, Power and Gas* will at no time touch upon matters pertaining to any phase of the labor question. On the other hand,

Harry F. Davis.

it will content itself with the task that has been set before it viz., successfully to carry out on a weekly basis, the objects originally intended to be covered on a monthly basis by *The Pacific Metal Worker*, exempting the proposed labor policy only.

The author's letter which appeared in the prospectus of *The Pacific Metal Worker* read, in part, as follows:

"As the name implies, *The Pacific Metal Worker* will occupy itself with the totality of the metal manufacturing industries of the Pacific Coast, dealing in a practical manner with all questions relating to iron and steel works, foundries, machine and boiler shops and kindred trades, both in their engineering and economic aspect. If this field should be considered too comprehensive and too vast to be cultivated by a single journal, we reply that its policy is planned to satisfy the peculiar needs of the Pacific Coast at this time, which are, as is well known, such that as yet no one branch of production is sufficiently extensive to demand exclusive representation.

"In order to facilitate the perusal of the journal by our readers, its matter will be treated under the following heads:

"*Technical*, in which will be treated new features ranking as achievements in the progress of the art. Here we naturally depend upon contributions from our readers, which should preferably be accompanied by proper illustrations or drawings, as greatly facilitating a clearer understanding of the text. We, of course, reserve the right to exclude from publication articles which are foreign to the scope of the journal.

"*Commercial*, which will be divided into two sub-heads, viz.: *Trade News*, containing letters from correspondents, prospective work, a review of contracts awarded and other matter of like importance; *Market Reports*, when obtainable, thereby fill a distinct want, particularly in regard to raw material, for the supply of which we still largely depend on foreign sources. Our foundrymen are not in close enough touch with their own market nor well versed in the foreign situation. They are paying too much for their raw material, and should keep posted on conditions that are vital to them. The market prices of the same articles in the various cities of the Coast, when well known by them, will be a big factor in helping to keep down buying prices.

"*Associations*. This department will aim to give brief epitome of the transactions of the various technical and trade societies of the Pacific Coast.

"The editorial policy will be one of absolute independence. *The Pacific Metal Worker* will not be the organ of any individual or any interest, but will deal fairly, frankly and fearlessly with all questions of the day. Its field will be the Pacific Coast, and there will be no discrimination or favoritism for the benefit of any particular locality. We have no axes to grind, no private ends to serve, and shall not hesitate to criticize where criticism is due, believing that the surest road to success lies along the line of absolute independence, outspoken expression of our views and entire good faith toward our readers."

ELECTRIC SMELTING OF IRON ORES.

As a sequence of the reports on "Electric Smelting of Iron Ores," published in 1904, 1906 and 1907, the Department of Mines of Canada has just issued the results of "An Investigation of an Electric Shaft Furnace," in operation at Domnarfvet, Sweden. The investigation was made by Dr. Eugene Haanel in December, 1908, on the invitation of the inventors, and the results given represent some of the latest developments of the electric smelting of iron ores. The report contains thirty-eight pages and is divided into four parts. Part I deals with the Domnarfvet furnace, the trial runs and the comparative costs of production of pig iron by the furnace. The other three parts, which are more of the nature of appendices, describe: (1) a new electric furnace for the manufacture of steel, (2) the manufacture of electrodes, (3) methods of manufacturing wood charcoal, this material being used to supply the carbon which enters into the composition of pig iron manufactured by electric smelting. Three full-page plates, from photographs, and numerous drawings illustrate the descriptive matter of the book, which, taken in conjunction with the reports previously published by the Mines Branch on the subject of electric smelting, adds materially to the literature on the electro-metallurgy of iron. This report and the preceding one on tungsten ores may be obtained on application to Dr. Eugene Haanel, Director of Mines, Department of Mines of Canada, Ottawa.

The Oregon Brass Works of Portland has purchased the present quarters of the Pacific Metal Works for $24,000. These they will occupy immediately upon the completion by the Pacific Metal Works of its new buildings, which will be about November 1st. It is the intention of the Oregon Brass Works to add another story to their new place as well as to make other important changes.

IRON AND STEEL INDUSTRIES OF THE PACIFIC COAST.

BY FRED HESSE.

The question whether the industrial development of the Pacific Coast will ever approach in magnitude that of the Eastern States can best be answered by a comprehensive review of its possibilities as a producer of minerals, and more particularly, of iron ores, with a summary of the methods at present available for converting these ores into iron or steel.

The value of an iron ore depends primarily on its analysis, but may be much qualified by the locality in which it is found, such as its relative proximity to fuel and fluxes and the facility with which it can be placed upon the market as pig iron. In fact, there may be, and actually are, ores quite rich in iron on this Coast, which, on account of their remoteness from railroads, are, for the time being, entirely valueless.

In recent years the attention of the Metallurgical world has been directed towards the so-called "black sands," which are very abundant on the Coast, and which in some instances are extremely rich in iron. I shall return to consider them later, and at that time will also discuss the methods of reduction which have been applied with more or less satisfactory results.

Before proceeding further, it may be well to insert here a few words on the classification of iron ores. Iron occurs in combination with a great many different elements, but there are only a few well-defined forms which so far have proved commercially valuable. These are the magnetites, the hematites, the limonites and the carbonates.

Magnetite is an anhydrous oxide of iron, and when perfectly pure has the following per cents of iron and oxygen: Fe_3O_4; metallic iron 72.4 per cent, oxygen 27.6 per cent. While magnetite should contain theoretically 72.4 per cent of iron, practically very little of it does, on account of the impurities that occure with it. These are such minerals as quartz, feldspar and hornblende. Magnetites always give a black streak and differ in this respect from the hematites, which have a red or brown streak. The magnetites also have magnetic properties.

The mineral franklinite is closely allied with magnetite and is sometimes considered as a mixture of magnetite with the oxides of manganese and zinc. It is generally considered as a mixture of ferric and manganese oxides with ferrous, manganous and zinc oxides. In appearance it closely resembles magnetite, but is less magnetic. In New Jersey, where it occurs quite abundantly, it is treated for the extraction of zinc, and the residue thus obtained is used for the manufacture of spiegeleisen.

Red hematite is an anhydrous oxide having a formula Fe_2O_3. It occurs in earthy and compact forms, and a number of varieties are found; that is, crystalline, columnar, fibrous and amorphous. Special names have been given to the various forms. Thus, the brilliant crystalline variety is known as specular iron ore; the foliated variety is known micaceous iron ore and the earthy variety as red ocher. This ore varies in color from a deep red to a steel gray, but all varieties give a red streak. Theoretically, it contains 70 per cent of iron and 30 per cent of oxygen.

Red hematite is the most important iron ore and the most widely distributed of any, being disseminated in greater or lesser extent in the soils, and nearly all rocks. In fact, most soils and rocks owe their color to iron. It is not confined to rocks of any particular geological age or to rocks of any particular kind.

Limonite or brown hematite is hydrated ferric oxide and is generally represented by the formula $2\,Fe_2O_3\,H_2O$. Hence it theoretically contains 59.89 per cent of iron. It occurs in both compact and earthy varieties. Pipe, or stalactitic ore and bog ore are brown hematite. Its color varies from brownish black to yellowish brown, but it always leaves a yellowish brown streak.

Ferrous carbonate has the formula $FeCO_3$ and therefore contains theoretically 48.28 per cent of iron. It occurs in several varieties known as spathic ore, clay ironstone and black sand. The carbonates are not largely used as ores in the United States, being mined to a small extent in Western Pennsylvania and Ohio.

[To be continued

UNITED METAL TRADES ASSOCIATION AT A.-Y.-P. EXPOSITION.

The United Metal Trades Association of the Pacific Coast pulled off a big stunt at the Alaska-Yukon-Pacific Exposition on Labor Day. An industrial exhibit and demonstration of modern foundry methods and equipment under the direction of H. S. Hastings, Commissioner of the U. M. T. A., were presented in the foundry building of the University of Washington on the A.-Y.-P. Fair grounds. Foundrymen from all along the Coast were in attendance. This is the first instance on record where any unusual interest has been manifested by Pacific Coast foundrymen looking toward improved methods of foundry practice. In a circular to foundrymen from the U. M. T. A. it was announced: "There has never before been such an opportunity on the Pacific Coast to procure the educational and practical features that are to be offered to you in this holiday when your shops are closed and your employees can be present." Through the courtesy of Mr. H. S. Hastings, Commissioner, we are enabled to present the following summary of the results obtained from the cupola as given by Mr. J. H. Linton of the Pacific Coast Testing Laboratory:

The Whiting cupola 22" inside diameter was used. The coke bed 30" above the top of tuyeres. The four charges were weighed up 500 lbs. and charged in two parts to insure a good mixture of the stock as it entered the cupola. The ratio of coke to iron after the bed was 1 : 8. Wilkeson coke was used in the heat, which is a native coke and shows that it can be satisfactorily used in any mixture.

The pig iron used in the semi-steel mixtures was Han Yang Chinese pig. In the gray iron mixtures No. 1 Southern pig was used, this being the only available iron containing enough silicon to use 50 per cent of car wheel scrap. Test bars were cast from each mixture and the following are the results in tabulated form. Test bars 2x1" on 24" support, load in the center. The No. 1A and No. 2A test bars were taken from a heat cast September 4th. They contained the same amount of steel as No. 1 and No. 2 respectively, but different chemical composition as shown by estimated analysis of the bar.

The silicon in the semi-steel mixtures was controlled by the use of 8 per cent silicon pig iron and the manganese by 80 per cent ferro manganese.

No. 1. Bar showed nearly white, being mottled in the center of the 2x1" section, due to the low silicon.

No. 2. Bar, while very close grained and fairly hard in the 2x1" section, was machinable.

No. 3. Bar shows the effect of about 50 lbs. of No. 2A which was left in the dump ladle, as it was time to tap for the 500-lb. charge of No. 3, thus lowering the silicon and phosphorous and raising the manganese.

No. 4. Bar was the same as No. 3 except the car wheel scrap, which was the rim of the wheels instead of the center as used in No. 3; to demonstrate that the chilling of iron, thus combining the carbon, does not affect that iron when remelted.

No. 5. Bar was the same as No. 4 going into the cupola; 20 lbs. of 50 per cent ferro silicon per ton of iron was added in the ladles, and while the silicon does not show any increase of No. 4, the test bar shows increased strength due to the treatment.

No. 6. Bar was cast of the same iron from the cupola as No. 4 and No. 5, except with the addition of 8 lbs. of 80 per cent ferro manganese per ton of iron in the ladle. This shows in the analysis of the bar, as the manganese is increased to .65 per cent and the sulphur is lowered to .062. Physically the bar is superior to No. 4, but has not quite the strength of bar No. 5.

Beginning with bar No. 2, these irons are all easily machinable; the ones with the higher manganese content being closer grained and tougher than the others.

The cost has been figured on the basis of:

Han Yang pig iron	$24.00 per ton
Southern pig iron	22.00 " "
Steel scrap	7.00 " "
Car wheel scrap	18.00 " "
8 per cent silicon pig iron	31.00 " "
80 per cent ferro manganese	.05 " lb.
50 per cent ferro silicon	.10 " "

We believe the foundrymen can readily see from the above the large amount of money saved in their adopting proper chemical mixtures.

"All the coke used in the demonstration was Wilkeson coke, which came from the Tacoma, Washington, collieries. Mr. Linton's report shows conclusively that this product can be used successfully, though slightly higher in ash than some other cokes. The test of melting steel with this coke showed its efficiency."

Bar No.	Semi steel mixture.	As charged into cupola. Estimated analysis. Si.	Sul.	Phos.	Mn.	T. C.	Breaking load.	Deflec. in 2'
1.	50% pig. 50% S. scrap.	1.11	.042	.23	1.95	2.06	2990 pounds	
1A.	50% pig. 50% S. scrap.	1.66	.042	.23	1.95	2 06	3340 pounds	.330
2	75% pig. 25% S. scrap.	1.69	.036	.25	1.95	3.00	3335 pounds	
2A.	75% pig. 25% S. scrap.	1.99	.036	.28	1.95	3 90	3530 pounds	.435

Continued.

Bar. No.	Analysis of bar. Si.	S.	Phos.	Mn.	C. C.	G. C.	2x1" bar Fracture.	Cost per ton.
1.	.87	.058	.25	1.50	1.77	1.62	Nearly white	$14.70
1A.	1.15	.061	.26	1.29	1 00		Gray close. Fairly hard.	16.75
2.	1.37	.055	.35	1.11	.74		Gray close grain medium	19.85
2A.	1.83	.069	.29	1.47	.73	2.20	Gray close grain fairly soft.	20.95

Gray Iron Mixture.

Bar No.	Semi steel mixture.	As charged into cupola. Estimated analysis. Si.	Sul.	Phos.	Mn.	T. C.	Breaking load.	Deflec.
3.	50% C. W. Cent. 50% pig.	2.17	.050	.78	.50	3.22	2830 pounds	.285"
4.	50% C. W. Rim. 50% pig.	2.17	.050	.78	.50	3.22	2800 pounds	.283"
5.	50% C. W. Rim. 50% pig. 20 lbs. Ferro S. per T. in ladle	2.28	.050	.78	.50	3.22	3216 pounds	.430"
6.	50% C. W. Rim. 50% pig. 8 lbs. F. M. per T in ladle.	2.28	.050	.78	.70	3.22	2950 pounds	.400"

Continued.

Bar. No.	Analysis of bar. Si.	S.	Phos.	Mn.	C. C.	G. C.	2x1" bar Fracture.	Cost Per ton.
3.	1.55	.073	.61	.49	.65	2.85	Gray medium close soft	$20.20
4.	1.71	.065	.78	.40	.63	2.85	Gray medium close soft	20.20
5.	1.70	.073	.59	.43	.66	2.66	Gray medium close soft	22.00
6.	1.71	.062	.81	.65	.66	2.84	Gray medium close soft	20.60

*Si., Silicon; Sul., Sulphur; Phos., Phosphorous; C. C., Combined Carbon; G. C., Graphetic Carbon; C. W., Car Wheel Centers; F. S., Ferro Silicon; F. M., Ferro Manganese; T. C., Total Carbon; S., Steel.

NEWS OF THE METAL TRADES.

The Western Steel Works, San Francisco, have enlarged the plant to the extent of doubling their floor space. This enables them to increase their output and make quicker delivery.

The Pacific Metal Works is to erect a new foundry and warehouse at Portland to cost approximately $30,000. The foundry will cover a floor space of 30x70 feet and will be constructed of steel and concrete.

The Doak Gas Engine Company of San Francisco has closed a contract with the Risdon Iron Works of San Francisco for one 100, one 55, one 30 and one 8 h. p. gas engine to be installed by the Risdon Iron Works.

Special organizers from San Francisco and elsewhere have been in Los Angeles for some time past where they are engaged in forming an iron trades council for the union machinists and molders there employed.

The Union Gas Engine Co., of San Francisco, has closed a contract with the Mascot Copper Co., in Wilcox, Arizona, for a 250 h. p. six cylinder gas engine to drive an air compressor; engine to be furnished in three months.

The Compressed Air Machinery Co. of San Francisco will move to their new shop at the corner of Stevenson and Ecker streets. Their new plant is equipped with all the modern facilities to increase their output and fill contracts on short notice.

The Pelton Water Wheel Co. of San Francisco are making extensive additions to their factory, in order to increase their manufacturing capacity. The added floor space will amount to 1,000 sq. feet. The gallery will carry the small tools and on the main floor heavy machinery will be installed.

The Pelton Water Wheel Co. of San Francisco, has received the contract for putting in a 500 k. w. Pelton Francis turbine in the Oregon Iron & Steel Co.'s plant at Oswego, Ore. The installations of this kind, made by the Pelton Water Wheel Co. in Oregon during this year alone amount to over 9,000 h. p.

The Benicia Iron Works, Benicia, California, has awarded to the Berkeley Steel Company of San Francisco a contract for fabricating and erecting the new steel buildings that are to be added to the plant. These new structures will greatly increase the capacity of the Benicia Iron Works for turning out plows, harrows, cultivators and orchard plows.

Supervising Engineer Asa Dunham of the North Pacific Steamship Company is authority for the statement that he and his associates will this coming spring construct a steel steamship to operate on this Coast as far south as San Francisco and as far north as Portland, touching at Eureka, Coos Bay and Portland. The new steamer is to be constructed especially for entering harbors with shallow water, such as Coos Bay and Port Kenyon. The boat will be well adapted to enter this port. The proposed craft will be 200 feet long, will have 35 feet beam and will draw but 8 feet of water. It will cost $150,000 and will be an 18-knot boat, to be equipped with 1500 horsepower.

It has been announced that on or about October 1st the construction of the Pacific Car & Foundry Company's big plant in the Wall addition, which is midway between the town of Point Richmond and the Alameda county line, will have been commenced. Representatives of the company anticipate that within sixty days the work of construction will have been sufficiently completed to enable the company to begin car building. The plant working under full capacity will employ more than 300 men. It will turn out ten railway freight cars per day. Its officials say that orders from the Southern Pacific Company and Santa Fe alone will be enough to keep the plant working at full working capacity for the next three years.

On September 2, the foundrymen of Portland, Oregon were notified by the molders' union of that city that the strike instituted two years ago had been declared off, and that the local was now willing to accept open shop conditions for its members. The men struck at the time when W. H. Corbett, president of the Willamette Iron & Steel Works, Portland, and the then president of the United Metal Trades Association of the Pacific Coast, posted an open shop declaration of principles in his foundry department. From here the strike spread to all the foundries in Portland. These have been operated for the past two years by non-union mechanics imported from the East.

The settlement of a strike lasting only five days, from September 6th to 10th, inclusive, has restored the nine-hour work day to the metal trades operators in Eureka, California. The walk-out was precipitated by the posting of notices in the shops of the Eureka Foundry and Pacific Gas Engine Works by their respective managements to the effect that the foundry and machine shop departments would on and after September 6th be operated on the nine-hour work day basis instead of under the terms of the San Francisco agreement. The controversy came to an end only after it had been proved beyond doubt to the mechanics that Eureka shops were unable longer to compete with those of Portland and Seattle for the iron work in their own locality.

Advance information to the effect that several special organizers to be appointed by the executive board of the international association of machinists will soon inaugurate a strenuous campaign for the eight-hour work-day for the metal trades mechanics in Oregon, Washington and Southern California, has been received in San Francisco as one of the more important decisions of the international in recent convention assembled at Denver. The San Francisco delegation is reported to have explained at length the manner in which the iron trades unionists had brought about in San Francisco a reduction from 9 to 8 hours by a graduated reduction at stated periods and so impressed was the general assembly, it has been announced, that steps will immediately be taken to institute a similar system where the nine-hour day still prevails.

PERSONALS.

F. Gottfried, vice-president of the Meese & Gottfried Co., San Francisco, is attending the Mining Congress at Goldfield.

Walter N. Kelly, secretary of the Meese & Gottfried Co., San Francisco, has taken his family to see the A.-Y.-P. Exposition at Seattle.

Edward J. Fowler, president of the Pacific Foundry Co. San Francisco, is "serving time" two afternoons a week on the Federal grand jury.

William S. Russell, president of the Phoenix Iron Works, Oakland, has been spending the latter half of the summer at Towles, Placer Co., California.

Lansing Kerr, the youngest son of James W. Kerr, president of the Setiger & Kerr Stove & Foundry Co., San Francisco, would, if he could, but he can't—he's "married now."

John A. McGregor, president of the Union Iron Works Co., San Francisco, is on a business trip to New York. Mr. McGregor plans to return on or about the first of November.

Charles M. Gunn, manager of the Columbia Steel Co., Portland, is at present in his old home town of San Francisco, where he can be seen at the company's local offices, 356 Market street.

Nathan Alper, president of the Standard Brass Castings Co., Oakland, has returned from an extended business trip in Oregon and Washington. Mr. Alper reports that business is brisk in the Northwest.

THE NOVAK REVOLVING DIFFUSER FOR CENTRIFUGAL PUMPS.

BY O. C. GOERIZ.

Prof. J. Novak of Prague, Austria, has secured basic patents for certain means, described in this article, to reduce the friction in rotary machinery, such as centrifugal pumps for liquids, blowers for gases, and turbines for either steam or water.

Several centrifugal pumps of the Novak type have been tested out very thoroughly and the claim of improved efficiency was fully proved.

The schematical drawings, Fig. 1 and Fig. 2, are merely intended to demonstrate the essential features of the invention, which make the Novak pump superior to other centrifugal pumps built for high heads, and which finally allow the adoption of high speed single stage Novak pumps for propositions where it was formerly necessary to use slow speed multistage pumps.

There are benefits gained in two ways. First: Reducing the friction at both sides of the runner; Second: Providing an ample whirlpool or diffuser space, with least side friction.

In Fig. 1 giving the section through a twin centrifugal pump of the regular design the friction between the runner

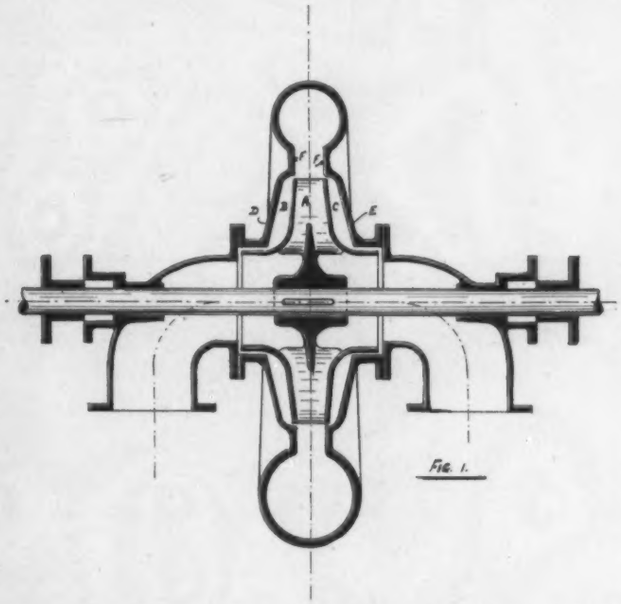


Fig. 1.

and the surrounding water volumes "B" and "C" tends to churn this water. Rough runner sides will churn the water faster than polished ones do, and with polished runners the efficiency will therefore be somewhat better. The work wasted to churn the water is then spent: partly by internal friction of the water molecules, but to its greatest part along the stationary walls "D" and "E" of the casing. In regard to the casing it would be most desirable that the same should be polished on the inside and that the water in chambers "B" and "C" should revolve as slowly as possible in order to have least loss. As to the polished runner surfaces just the contrary might appear desirable. In fact if the surface conditions of runner and casing sides are exactly alike, friction between the runner and the water will churn the water at half speed of the runner, while friction between the churned water and the stationary side walls prevents any further increase of speed. If the runner is comparatively very rough, the water ring will revolve at a velocity larger than the half speed, but if the runner is polished and the side walls should be very rough, then the water in the chamber "B" or "C" has a considerably smaller velocity. The selection of the clearance space between runner and pump casing bears upon this question. With a big clearance there is much water which wastes considerable energy by its internal friction while the energy loss along the pump casing may be small in comparison. On the other hand a very small clearance allows the small volume of water to gain a very high speed and the friction loss occurs now chiefly along the side walls.

For the whirlpool space between the walls "F"-"F" in the ordinary design it may be said that it is not advisable to overdo in that respect, as it must become a source of waste if extended too far. The principal idea underlying a whirlpool diffuser consists in the gradual reduction of speed when water travels in logarithmic spirals and thus penetrates ever-increasing cylinders. If no loss of energy would occur, the whole kinetic energy (or energy of motion) ought to be transformed into potential energy (or energy of pressure). It is evident that a certain radial extension of the walls "F"-"F" must give highest efficiency, and if they are carried too far the efficiency must drop on account of the friction losses along these walls. On the other hand, if the radial extension of the walls "F"."F" is too small, or even non-existent, the water thrown out by the runner is bound to create very considerable disturbances in the volute.

For high heads the water must be issued from the impeller at a considerably higher velocity than for low lift propositions, and the ordinary whirlpool arrangement as in Fig. 1 would be a failure on account of the side friction along the walls "F"-"F," also the disturbance in the volute would cause considerable losses of efficiency should these walls be

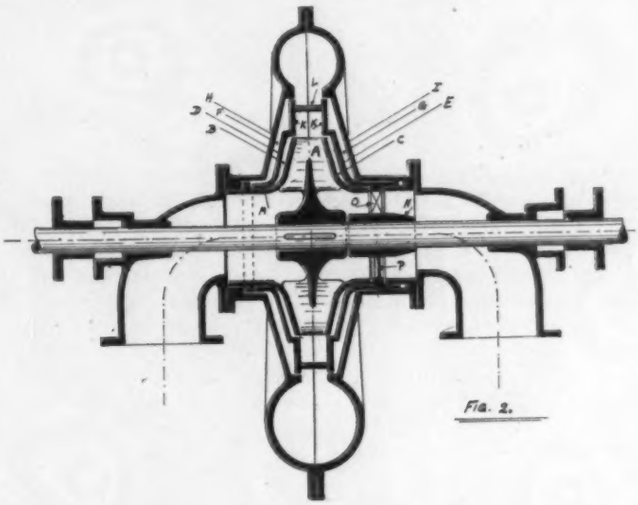


Fig. 2.

omitted, therefore under such conditions the so-called "turbine pumps" deserve the preference. The diffuser passages between the turbine vanes can be regarded as being individual scrolls for proportionate fractions of discharge.

The Novak diffuser which is placed around the runner does away with the excessive friction loss of the sides of the whirlpool chamber, and the selection between a Novak-volute and a Novak-turbine pump depends merely upon the amount of head under which it has to deliver water. Fig. 2 typifies a Novak diffuser consisting of one set of discs revolving freely and concentric with the shaft and runner. The halves "D" and "E" of each set are connected by stay bolts "L" which also assist the runner discharge to drive the diffuser by friction along the sides "K." The diffuser half "D" as such slides loose on the runner sleeves "M," as shown on the left side of the drawing, and the mechanical friction at this point helps also to revolve the diffuser to some extent.

Certain mechanical improvements which have been suggested by the writer of this article, but which naturally fall under the domain of the basic Novak patents, are indicated on the right side of Fig. 2. Here a bushing "N" is shown which is loose on the shaft but which is rigidly connected to the Novak diffusor half "E," either by vanes "O" similar to propeller blades, or merely by stays "P," therefore supporting the

whole diffuser directly by the shaft itself. By this alteration a material reduction of mechanical friction is gained, further if the water is gritty it is easy to feed oil or grease through a bore in the shaft directly into the clearance between bushing "N" and the shaft. In addition provision is made in the improved design to build the runner and all the Novak diffusers in such a manner that they show no end thrust whatever, by eliminating the same automatically.

It is known that the friction resistance between a revolving disc and water depends on the squared relative velocity, while the energy loss must conform with cubed ratio of the relative velocity between disc and water.

in "F" acts like a brake, but both have to balance, otherwise the diffuser must gain or lose speed, until such equilibrium of friction forces shall be attained.

This is the one part of the Novak improvements.

Contemplating the other and more important innovation, the two sketches Fig. 1 and Fig. 2 must be compared again.

In Fig. 1 water rushes out of the runner at a velocity which for convenience sake may be termed "full speed" and along the walls "F" of the stationary diffuser a certain part of the energy contained in the water must be dissipated by "disc-friction." The relative velocity between water and side walls is the entire full speed.

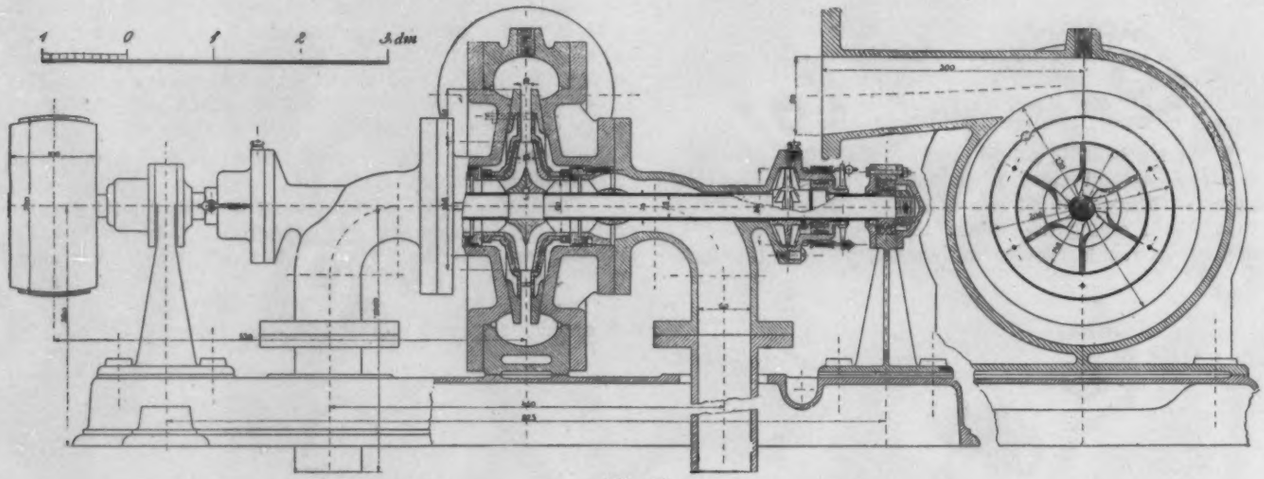


Fig. 3.

Applying this to a comparison of disc friction for Fig. 1 as against Fig. 2, and assuming that the runner in both cases revolves with the same speed the following conclusion can be reached.

In Fig. 1 the water volumes "B" and "C" can be assumed to run at half speed, which is the middle between the full speed runner and the stationary side walls. The relative velocity, or difference between full and half speeds, is therefore one-half speed.

In Fig. 2 the diffuser "D"-"E" revolves at half speed itself, as proven by the tests made with Novak pumps, then the water volumes "B" and "C" are churned with say three-quarter speed, or the relative velocity is one-quarter.

Now in Fig. 2 the walls "K" which belong to the diffuser halves "D" and "E" revolve again at half speed, and the relative velocity can be expressed as being half speed. Therefore the frictional resistance in Fig. 2 as against Fig. 1, assuming equal extension of the diffuser walls in radial direction and similar conditions of the surfaces, shall be one-quarter, the loss of energy one-eighth only.

Ordinarily one Novak diffuser will do, but for large heights of lift it can be cut into two or more independent diffusers surrounding one another, each of them revolving at proportionately reduced speeds and gradually slowing the water down in the whirlpool chamber formed by them. Finally the water can be handled either by the ordinary volute or by a

Table I. Test Results.

	Series Numbers of Tests.									
	1	2	3	4	5	6	7	8	9	10
Voltage	238	238	236	236	234	231.6	229.8	237	225	226
Amperes	4.4	1.25	8.5	8.8	10	22	23.8	10.3	19.5	21.8
Electr. input in KW	1.05	0.3	2.0	2.07	2.34	5.1	5.47	2.44	4.39	4.93
R. P. M. of motor	1042	zero	1000	1000	1030	990	950	1040	980	980
Efficiency of motor, per cent	.....	.....	33	35	39	60	61	39	59.5	60
Brake—H.P. from motor pulley	.....	.....	0.92	0.985	1.24	4.16	4.55	1.293	3.55	4.02
Loss in belt, H.P. assumed	.....	.....	0.30	0.300	0.30	0.30	0.30	0.300	0.30	0.30
Brake—H.P. on pump shaft	.....	.....	0.62	0.685	0.94	3.86	4.25	0.995	3.25	3.72
R. P. M. of pump	zero	zero	2220	2220	2260	2200	2000	2270	2160	2170
Total head in feet	.....	.....	zero	zero	50.5	54.5	49.5	55.8	61.7	57.1
Gallons per minute discharge	.....	.....	.....	.....	zero	129	153	zero	136	163.5
Duty of pump in W. H.P.	.....	.....	.....	.....	zero	1.805	1.945	zero	2.15	2.40
Efficiecy of pump	.....	.....	.....	.....	.....	46.8	45.8	.....	66.2	64.5
Diffusor revolving=R	.....	.....	R	F	F	F	F	R	R	R
Diffusor held fast=F										

The HP. are Metric HP. of say 1½ per cent less than British HP. The discharge in liter per second has been translated into U. S. gallons per minute. The total head in meter has been translated into feet.

For equal runner diameters and equal runner speeds it would therefore follow that because the relative velocity between the runner sides and the water in Fig. 2 is one-half of that in Fig. 1, the friction resistance must be one-quarter, and the loss of work by friction must only be one-eighth of what losses occur in the ordinary case Fig. 1. The energy losses in chambers "F" and "G" do not sum up with the losses in "B" and "C." What waste is going on in "F" and "G" does not directly affect the energy required at the pump shaft. However, it influences the velocity of the diffusor halves "D" and "E" and thus indirectly the waste going on in "B" and "C." The friction loss in "B" drives the diffuser and the loss

set of stationary turbine vanes.

Thus in a Novak pump one has simply once to produce sufficient kinetic energy by one (single stage) high speed runner and then gradually to slow the liquid down with least friction in order to reach lifts even as high as 750 feet.

The above table of test results obtained with the small Novak volute pump represented by Fig. 3, is translated from the reports which have been published in German engineering papers. The pump with a 3½-inch discharge had two suctions of about 2⅜ inches diameter each, the runner diameter was about 5¾ inches, and it was designed to deliver about 140

(Continued on Page 326)

NEWS OF THE STATIONARY ENGINEERS.

PREAMBLE.—This Association shall at no time be used for the furtherance of strikes, or for the purpose of interfering in any way between its members and their employers in regard to wages; recognizing the identity of interests between employer and employe, and not countenancing any project or enterprise that will interfere with perfect harmony between them.

Neither shall it be used for political or religious purposes. Its meetings shall be devoted to the business of the Association, and at all times preference shall be given to the education of engineers, and to securing the enactment of engineers' license laws in order to prevent the destruction of life and property in the generation and transmission of steam as a motive power.

California.

No. 1. San Francisco. Thursday, Central Hall, 124 Fulton St. Pres., A. C. Arbuckle. Sec., Herman Noethig, 900 York St.

No. 2. Los Angeles. Friday, Eagles' Hall, 116½ E. Third St. Pres., Gabriel Allen. Fin. Sec., Harry Notthoff, 1307 Winfield St. Cor. Sec., W. T. W. Curl, 4103 Dalton Ave.

No. 3. San Francisco. Wednesday, Merchants' Exchange Bldg. Sec., David Thomas, 914 O'Farrell St.

No. 5. Santa Barbara. Geo. W. Stevens, 2417 Fletcher Ave., R. R. No. 2.

No. 6. San Jose. Wednesday. Pres., W. S. Pierson. Sec., Leal Davis, 350 N. 9th St.

No. 7. Fresno. Pres., J. F. Wagoner. Sec., F. J. Whitney, Box 8.

No. 8. Stockton. Thursday, Masonic Hall. Sec., S. Bunch, 626 E. Channel St. Pres., Jos. Gieger.

Oregon.

No. 1. Portland. Wednesday, J. D. Asher, Portland Hotel. Pres., O. H. Reed.

No. 2. Salem. A. L. Brown, Box 166.

Washington.

No. 2. Tacoma. Friday, 913½ Tacoma Ave. Pres., Geo. E. Bowman. Sec., Thos. L. Keeley, 3727 Ferdinand St., N., Whitworth Sta.

No. 4. Spokane. Tuesday. Pres., Grant Tuttle. Sec., J. Thos. Greeley, 0601½ Cincinnati St.

No. 6. Seattle. Saturday, 1420 2d Ave. Pres., J. H. Beckman. Sec., J. C. Miller, 1600 Yesler Way.

Practical letters from engineers and news items of general interest are always welcome. Write your items regardless of style. Communications should be addressed to the Steam Engineering Editor.

CALIFORNIA No. 3.

At the regular meeting of California No. 3 on September 22d a number of questions of interest were discussed by a large gathering of the members, whose interest in the discussions is evidenced by the constantly increasing attendance. Following are a few of the questions to be discussed at the next meeting, September 29th:

Given: A steam driven air pump, diameter 24", stroke 20", r. p. m. 100, vacuum by gauge 27". What h. p. is required to run this pump? What would an indicator card taken from it look like?

What will be the leakage in lbs. of steam per hr. past a piston valve of an engine? Diameter of valve 5", gauge pressure 150 lbs., exhausting over the ends into the atmosphere, the valve to have worn 2/1000 of an inch. What effect will this leakage have on the governor? What causes pitting of a steel piston rod?

The members of the general committee have announced that a grand ball and entertainment will be given by the two associations at some time prior to the holidays. Particulars to be given out later.

SAN FRANCISCO, Cal., Sept. 22, 1909.

To the Editor: I was very much interested in the paper submitted by the "Cheerful Idiot" and published in a recent issue of your Journal. I can vouch for the truthfulness of all therein contained, and that individual has my most earnest sympathy, for on several occasions it has been my lot to meet and correct similar situations. However, I cannot quite agree with the writer in his denunciation of the architects. While he is one of the principal factors in the enterprise he is not the only one, and the owner in my judgment in many instances shares with the architect the responsibility for whatever result may be obtained.

Where the architect is given plenty of capital and full authority to erect a first-class building complete and perfect in all its details he alone is responsible, and if things are not as they should be when the building is turned over to the owner the architect cannot be too severely censured. But in the great majority of instances the owner limits the architect both as to money and methods, and we must in justice recognize this situation.

If the troubles consequent to an improperly designed and built structure ended with the completion of the latter it would not be a question of such importance, but throughout the entire life of the institution there is a ceaseless annoyance and expense, and I fully agree with the "Cheerful Idiot" when in his final summing up he urges the advisability of the owner employing a competent and practical engineer to represent him during the construction of the building. I further believe that the present practice of letting the contract for the heating and power plant equipment to a steam heating contractor is a bad one, because not one in twenty of those who bear this title are competent to properly lay out and install the power plant equipment.

The preferable and proper plan has been adopted in the new Palace Hotel in San Francisco. Here the steam heating and piping throughout the building was installed by the steam heating contractor, the specifications requiring him to connect his work with the power plant piping at the basement ceiling. The latter equipment was designed and installed by a prominent firm of contracting mechanical engineers. The entire piping system was furnished by the Crane Company on the contractor's designs, and so perfect was the work done that in no instance did any part of the same require springing or changing. When the time came for the steam heating contractor to connect the two portions of the work the power plant superintendent noticed a number of men using various leverages in an endeavor to spring the main heating riser about 4 inches laterally into line with the power plant pipe. It is quite unnecessary for me to attempt to reproduce his language at that moment. Suffice it to say that the connection was not made until the both pipes had been brought into perfect alignment.

Thus we see that in order to secure the results that the designing architect, the owner who puts up the coin, and the various contractors should be striving for, unanimity of effort should be the watchword, and any party who will not work in this manner is unfit to be trusted with any work of importance.

A READER.

TRADE NOTES.

The Seattle Lighting Company has removed to 1314 Fourth avenue, Seattle.

The Reynolds Electric Co. has removed to 524 First avenue south, Seattle.

The General Electric Company of San Francisco now have an electric delivery wagon.

The Western Electric Company of San Francisco sold two large switchboards to the Clear Lake Telephone Company.

The Standard Electric Construction Co. has started work on the wiring of Fillmore and Market streets, San Francisco, for the electrical illumination during the Portola festival.

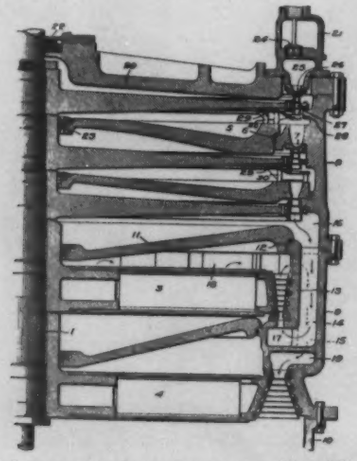
B. Gustav has opened an electric supply house at Grangeville, Wash., with a stock of electric equipment. He has a contract to do all wiring for the Grangeville Electric Company.

The Allis-Chalmers Company of San Francisco has just closed a contract with the Great Western Power Company for lowering transformers used in the irrigation district No. 7.

The United States Civil Service Commission announces an examination on October 27, 1909, to fill vacancies as they may occur in the position of teacher of mechanical drawing, in the Indian Service, at salaries ranging from $600 to $840 per annum.

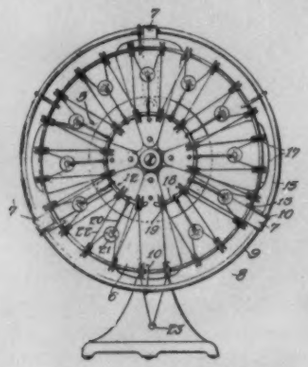
PATENTS

932,849. Enforced-Flow Elastic-Fluid Turbine. William L. R. Emmet, Schenectady, N. Y., assignor to General Electric Company. An elastic fluid turbine comprising a plurality of stage compartments working at different pressures, a nozzle for a high pressure stage which converts the available pressure thereof into velocity, and whose end pressure is substantially the same as that of the exhaust from the stage compartment, wheel buckets, co-operating therewith to abstract the velocity, an annular nozzle for a low pressure stage which partially converts the available pressure of the stage into



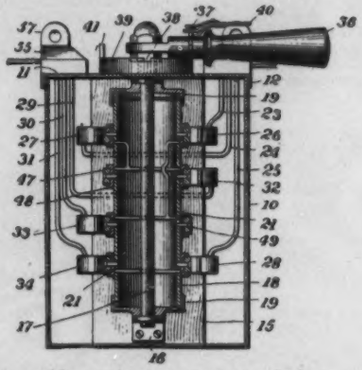
velocity and has an end pressure considerably in excess of that of the exhaust from the stage compartment, a wheel having rows of buckets, all of which are active, a complete annular row of intermediate buckets, the said rows of intermediate and wheel buckets alternately converting the pressure of the fluid into velocity and abstracting it as the fluid flows through the stage compartment, and means for causing the fluid to flow in a reverse direction through certain of the stage compartments.

933,989. Electric Heater. Carl E. Johnson, Los Angeles, Cal., assignor of one-half to Wm. W. Piddington, Los Angeles, Cal. In an electric heater, the combination of an electric fan motor, of an electric heating element comprising an electric



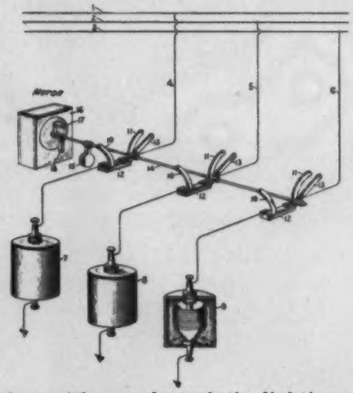
resistance, said element being detachably secured to said fan motor and both being connected in parallel, and means to automatically adjust the heating element while a current is passing therethrough.

933,956. Electrical Switch. Frank H. Buffehr, Millers, Nev. In an electrical switch, the combination with contact fingers, a drum having contact segments thereon for co-operating with said fingers, one pair of contact fingers on opposite sides of the drum being in alinement and connected to the line, and the other set out of alinement and connected to the



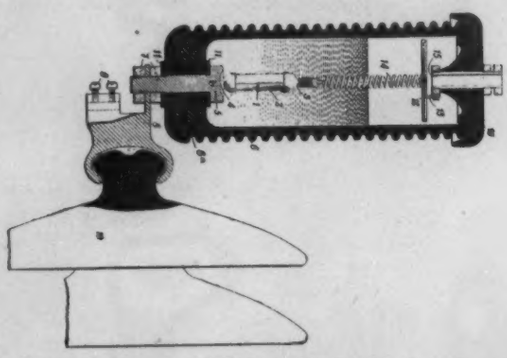
feeder circuit, said contact segments being suitably interconnected whereby when the drum is moved from one position to another position the connections to the feeder circuit are reversed.

933,826. Intermittent Line Switch. Elmer E. F. Creighton, Schenectady, N. Y., assignor to General Electric Company.



The combination with an electrolytic lighting arrester, of a spark-gap in series therewith, and a switch for closing said spark-gap at will.

933,787. Fuse Receptacle. Bertrand P. Rowe, Wilkinsburg, and Samuel M. Kintner, Pittsburg, Pa., assignors to Westinghouse Electric & Manufacturing Company. The combination with an insulating receptacle having a cover provided with a vent opening and a shield for said opening, and a body



of insulating fluid contained in said receptacle, of separable circuit terminals within the receptacle, and an inclosed fuse device connected between the terminals and adapted to be ruptured upon the passage of more than a predetermined amount of current.

INDUSTRIAL

SMALL MOTORS.

The General Electric Company has recently placed on the market a new line of alternating and direct current fractional horsepower motors. These have been termed the "drawn shell" type due to the fact that they have their field and stator iron securely bound in shells drawn from plates of steel. The fields of the direct current motors are built up of punchings, a construction which secures much smaller diameters than is possible with the usual cast steel or iron magnet frames. The field and stator punchings are assembled under compression, with thick punched rings to serve as spacers for the end turns of the winding, and the whole is pressed into a steel shell. The edge of the shell is spun over securely holding the iron in place. This construction is shown in Fig. 1.

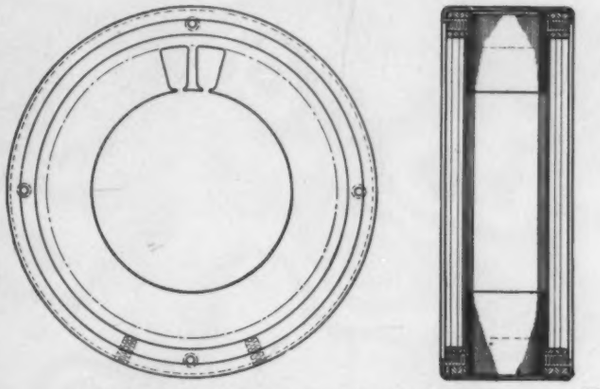


Fig. 1. Construction of Motor Field.

These steel shells or frames for both direct and alternating current motors are cylindrical, and have no lugs or projections whatever. They are placed on an arbor and the rim is turned and grooved to receive the heads, which are made of cast iron. The heads are machined on centers to fit the frame, consequently the whole structure of the motor is correct, and accurate air gap and alignment of bearings is the result. The standard base is shown in Fig. 2 and this is securely held in place by two screws tapped into the magnet frame. The shafts of all motors are of ample size and the bearing linings are of bronze. The induction motors have high power factor, efficiency, and liberal overload capacity, with moderate heating. This is evident from the curves in Fig. 4. The windings are of the concentric type, and the starting coils are automatically cut out by a switch when the motor has reached a suitable speed. A centrifugal clutch is furnished when necessary.

Since the frames are cylindrical and without lugs and projections they may be fitted with ease to any form of support, and the heads may be turned through any angle to permit of the motor being inverted or attached to a wall or vertical bracket.

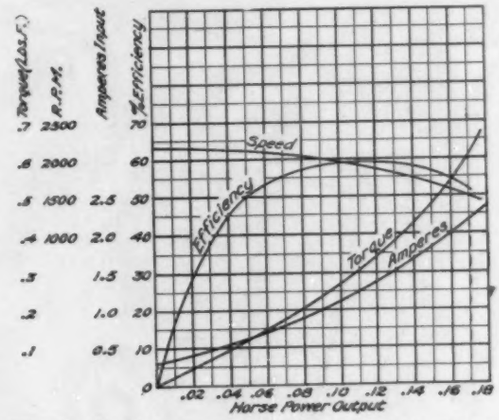


Fig. 3. Typical Curves of Direct Current Motors.

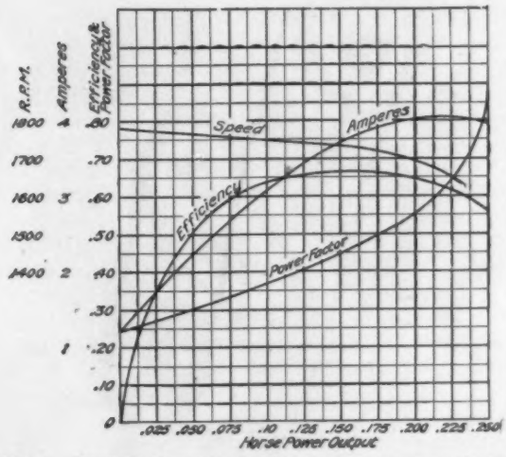


Fig. 4. Typical Curves of Alternating Current Motors.

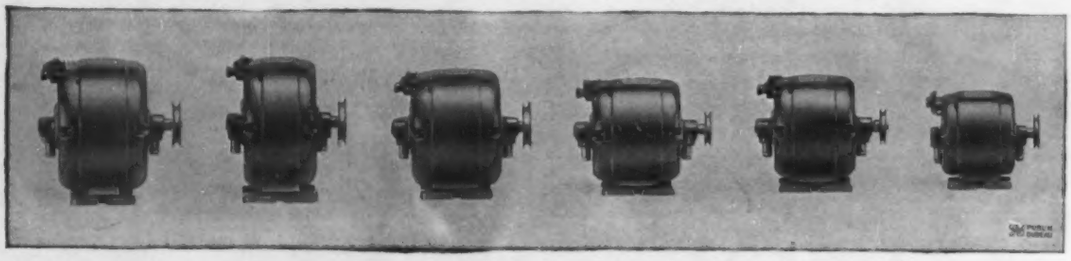


Fig. 2. Complete Line of Alternating Current Motors.

This method of construction eliminates the outside frame of cast iron that is usually employed, as well as the necessity for all holes through the active iron. It also makes possible accurate methods of manufacture, which ensures perfect concentricity of parts and an alignment not usually found when the common cast shell is used.

These motors are supplied to meet all commercial circuit conditions of voltage, and, in the case of the induction

motors, can be supplied for the various frequencies with either single or polyphase winding. If one wishes to have direct and alternating current motors of the same dimensions so as to use them interchangeably it will be necessary to interchange an alternating current with a direct current motor of the next larger capacity. Their electrical characteristics are clearly shown by the curves in Figs. 3 and 4.

The motors are very compact, light in weight and of fine workmanship. They are adapted to such service as driving sewing machines, small lathes, automatic musical instruments, air pumps, small blacksmith forges, dental instruments, jeweler's tools, pumps, buffing and grinding tools and a large variety of small special machines.

BOOKS RECEIVED.

"Hydro-electric Developments and Engineering." By Frank Koester. 454 pages, 8x11 inches, 500 illustrations. D. Van Nostrand Company, New York City, and Technical Book Shop, San Francisco. Price, $5.00.

This handsome volume has been compiled as a practical and theoretical treatise on the development, design, construction, equipment and operation of hydro-electric transmission plants. It is a companion volume to "Steam-Electric Power Plants" by the same author. It differs from other texts in presenting in one volume the principal features of both hydraulic and electric design. It is in no sense a book of instruction, but rather one of description, its value to the designer lying in its suggestions. The descriptions of various European plants are of particular interest. Treatment of American practice is limited largely to Eastern installations, few details of Western plants being given. It brings into compact form a number of articles published in technical periodicals, supplemented by a brief outline of the elements of hydraulics and electricity. For convenience the treatment is divided into three parts: the transformation of water power into electrical energy, the transmission of high tension electrical current, and modern American and European hydro-electric developments. As stated in the preface, reference is made to the following novel features: "Airshafts and equalizing chambers in connection with pressure tunnels. Seamless-welded, flangeless, telescoping penstocks to facilitate shipment and to eliminate expansion joints. Siphon system, in contradistinction to the inverted siphon—which latter is a misnomer. Impulse wheels with draft tubes and multiple, non-water-wasting nozzles. Compound turbine on a single shaft, the discharge of one being the supply of the other. Rapid and complete turbine tests by curtain methods and autographic recording device. Thirty-thousand-volt generators and their efficient protective devices against lightning. Unique combination of single and three-phase high-tension transmission systems from three-phase generators. Wagon-panel switchboard systems. Segregation and decentralization of switchboards. Continuous water-flow grounders and horngaps with micrometric setting. Two-legged transmission towers and line-crossing protection."

As a guide to modern hydro-electric practice it is a valuable addition to every engineer's library.

SANTA FE EXTENDS TELEPHONE TRAIN DISPATCHING.

The Atchison, Topeka & Santa Fe Railway has recently installed the telephone for train dispatching between Chicago and Newton, Kansas, a distance of 659 miles. This equipment is but a small portion of what is being equipped, it being the intention of the railway company to extend this service over its entire system. At the present moment there are eighteen different divisions upon which the trains are dispatched by telephone. In this way 380 stations are reached in a total distance of 1925 miles. The telephone equipment being used was furnished by the Western Electric Company, manufacturers of the well-known Bell telephones. This company has furnished over 50,000 telephones to various railroads throughout the United States.

A SIGN OF THE TIMES.

Among the signs of the times are the signs of the Western Electric Company. Within a few months they will be mounted on the side boards of all trucks used by the various houses in the United States.

The sign is the well-known "Consult the Map" trade escutcheon of the company, but will in each location bear the address of the local house instead of the phrase "Consult the Map."

A Sign of the Times.

The signs are black, the lettering being embossed and silver leafed. The accompanying photograph, taken in the front of the 13-story building of the New York City house, shows the new sign mounted.

The wholesale labeling of the hauling and delivery departments of the company signalizes the rounding out of the company's wide sweeping advertising campaign. In this respect it is a sign of the times.

TRADE NOTES.

The Monarch Lumber Company of Portland, Ore., has installed two 500-kilowatt Westinghouse steam turbines in its mill at Stockdale, Ore., which will be employed to drive 2300-volt, three-phase, 60-cycle, alternating-current generators supplying the local lighting and power load.

The Kellogg Switchboard and Supply Company will install a complete two-section switchboard of the latest type for the Logan Home Telephone Company, Logan, Ohio. This includes one chief operator's desk, one wire chief's desk and complete exchange equipment. In addition the Kellogg Company have received orders for twenty-six boards during the first half of the present month.

The Arrowhead Portland Cement Company will erect a one-thousand-barrel per-day mill at Etiwanda, San Bernardino county, California. Smith, Emery & Co., chemical engineers of San Francisco, will have entire charge of the work, and it is proposed to have the plant finished and in operation inside of twelve months. The cost of the mill and equipment will be about $700,000, the greater portion of the capital being furnished in Los Angeles.

NEW CATALOGUES.

Westinghouse Gas Producers for Bituminous Fuels are illustrated and described in Circular W. M. 503 from the Westinghouse Machine Company of East Pittsburg, Pa. In addition to an excellent theoretical exposition of the principles of gas producers the bulletin contains many valuable practical suggestions.

NEWS NOTES

FINANCIAL.

HOQUIAM, WASH.—The Hoquiam Water Co. will issue bonds to the amount of $122,000.

LOS ANGELES, CAL.—A $40,000 issue of electric light ing bonds of the city of Glendale has been awarded to W. H. Holliday.

NEWPORT BEACH, CAL.—This city will vote $40,000 bonds for waterworks. The Newport Water Co. plant will be taken over.

SANTA FE, NEW MEX.—Hagerman, N. M., has voted in favor of a proposition to issue $25,000 in bonds for a municipal waterworks system.

COLUSA, CAL.—An ordinance has been passed authorizing the issuing and sale of municipal improvement bonds for construction of a waterworks and water system.

ELSINORE, CAL.—A petition has been received by the Board of Trustees asking for a special election for voting of bonds for purchasing an electric light plant.

INCORPORATION.

LOS ANGELES, CAL.—Acre Oil Co., capital stock $10,000, by H. W. Zeiger, A. N. Arnaz and G. B. Smith.

BAKERSFIELD, CAL.—Alvarado Oil Co. by C. L. Bullard, A., M. F. and V. C. McCullough, J. V. and L. H. Mitchell.

PORTLAND, ORE.—Oregon Acetylene Lighting Company, $25,000, by C. K. Holsman, C. B. Perkins and J. E. Bleser.

SAN BERNARDINO, CAL.—North Colton Water Co., capital stock $15,000, by E. J. Rice, Seth and Luttie Hartley.

SAN FRANCISCO, CAL.—Pyramid Oil Co., capital stock $1,000,000, by G. S. Johnson, F. G. Cox, R. K. Hawk, C. J. Bowler and J. B. Cottle.

SAN FRANCISCO, CAL.—High Gravity United Oil Co., capital stock $2,000,000, by J. S. Osborne, W. Backus, H. R. Wade, J. E. Kerr and A. M. Tridell.

HANFORD, CAL.—Lemoore Oil Co., capital stock $300,000, by H. W. Byron, Oscar Odale, Stiles McLaughlin, A. L. McKay, L. H. Byron, A. and J. H. McGlashan.

HANFORD, CAL.—Colt Oil Mining Co., capital stock $200,000, subscribed $102,000, by C. W. Barrett, W. H. Reyburn, W. H. Thompson, Alvah Clow and J. J. Smith.

SEATTLE, WASH.—The Oregon and Washington Long Distance Telephone Company has been incorporated with a capital of $1,500,000 by Samuel Hill, W. G. Collins and Henry Lindley.

SANTA CRUZ, CAL.—Articles of incorporation of the Midfield Oil Co. have been filed here by James A. Hall, Oliver Whiteman and F. G. Troy of Watsonville, L. I. Vinton of San Jose, and Lucas & Smith of Santa Cruz. The capital stock is $1,000,000.

SPOKANE, WASH.—The Skagit, Cascade & Chelan Railway Company has been incorporated with a capital of $25,000,000 by W. W. Shenk, to build an electric railroad from Rockport to Spokane with branches to Silver basin and to the British Columbia line. Power will be generated on Thunder Creek.

TRANSMISSION.

MARYSVILLE, CAL.—A three-wire electric power line is being built from the Colgate powerhouse to the California Mother Lode Mining Co.'s plant at Indiana ranch.

SAN FRANCISCO, CAL.—The E. D. Crowley Co. of San Francisco has been awarded the contract for constructing a power plant at the Mare Island navy yard at $50,894.

SAN LUIS OBISPO, CAL.—Sealed bids are being received by the State Engineer for the construction of a power house at the California Polytechnic School at San Luis Obispo.

WENATCHER, WASH.—Frank McKean, general manager of the Ranier Power & Irrigation Co., of Seattle, has secured control of power plants along the Columbia River from which 45,000 h. p. will be developed.

LOS ANGELES, CAL.—The Pacific Electrical Works of Los Angeles, the Snarling Electric Co. of San Francisco, and the Crescent Electric Co. of Oakland have consolidated under the name of the Pacific States Electric Co.

MONTEREY, MEX.—The Mines of Mexico Company, of Denver, Colo., has plans under way to erect a large hydroelectric plant on the Mayo river for furnishing its mines in the State of Sonora with power for both mining and milling purposes.

VICTORIA, B. C.—Victoria Contracting Co., Ltd., is putting in an electrically driven rock crushing plant near Victoria, B. C. The generator is 75 k. w. capacity and is direct connected with a Skinner automatic engine. All drilling, blasting and hoisting will be done by electricity. This will be unique in the line of rock crushing plants. It was designed and constructed by J. J. Maney of Seattle, Wash.

JACKSON, CAL.—Notice of the location of a reservoir site to cover 800 acres of land and of ditch rights to and from it, together with claims to 20,000 inches of the waters of Mokelumne River, have been filed for record by the General Electric Power Co. of California. Its locations are between the old Blue Lakes reservoir system, now owned by the Pacific Gas & Electric Company, and the other holdings of that company, and while it will use the water stored by the Pacific Company, it will return it to the Mokelumne River after creating electric power from it.

TRANSPORTATION.

SAN DIEGO, CAL.—The City Council is receiving sealed bids for a franchise to construct and operate a street railway.

LOS ANGELES, CAL.—The Board of Supervisors will receive sealed bids up to October 22d for an electric street car franchise on Adams street.

SANTA BARBARA, CAL.—The Council has granted a franchise to the Santa Barbara Consolidated Railway Co. for a street car line on Fourth avenue.

SAN DIEGO, CAL.—The City Council has passed an ordinance granting to E. Bartlett a Webster-street railway franchise along Thirtieth street in this city.

LOS ANGELES, CAL.—The Los Angeles Electric Railway will begin next week an extension of the Washington street line from its present terminus to Rimpau street.

SANTA BARBARA, CAL.—The City Council will receive bids up to October 21st for a street railway franchise applied for by the Santa Barbara Consolidated Railway Co.

LOS ANGELES, CAL.—The City Council of Nogales, Ariz., has granted a franchise for the construction of an electric street railway to be in operation within the next two years.

SANTA BARBARA, CAL.—The City Council has passed an ordinance granting to the Pacific Improvement Co. a franchise for the construction and operation of certain electric lines in the city.

NORTH YAKIMA, WASH.—Manager Richards of the street railway, has placed an order for $50,000 worth of equipment and will at once begin the construction of five miles of track west of the city.

SAN FRANCISCO, CAL.—J. E. Woodbridge has resigned from the railway engineering department of the General Electric Co. to take charge of the work of supplying power to the United Railroads of San Francisco from the Stanislaus transmission lines.

SEATTLE, WASH.—The Stone & Webster interests which recently took over the Seattle-Everett Interurban Railway are now engaged in constructing the remaining 18 miles between these towns. This stretch will be of catenary construction which is also to be subsequently employed over the rest of the line. It is expected that the running time over this 30-mile section will be one hour and 30 minutes.

WALLA WALLA, WASH.—Gilbert Hunt, of Walla Walla, president of the Washington Traction Company, announces that English bankers in London will back the construction of an electric railway between Kennewick and Pasco; also that the company has increased its capital stock from $3,500,000 to $5,000,000. The line projected is from Dayton to Pasco by way of Waitsburg, Walla Walla and Wallula. It is expected that construction work will begin on the valley line the latter part of September.

ILLUMINATION.

ABERDEEN, WASH.—The town of Cosmopolis has granted an electric light franchise to the Grays Harbor Railway & Light Co.

LIVE OAK, CAL.—The Live Oak and Encinal Light & Power Co. will extend their line to Live Oak to be used for lighting purposes.

MONTEREY, MEX.—The Monterey Railway, Light & Power Co. is preparing to make some extensive changes in its plant at Allende and Guerrero streets.

ESCONDIDO, CAL.—The Town Trustees have awarded a franchise for an electric lighting, power and heating plant to Seth Hartley of Colton. His bid was $100.

LOS ANGELES, CAL.—Sealed bids will be received by the Board of Supervisors up to October 11th for lighting certain streets in Arlington Heights Lighting District with electric arc lights.

LOS ANGELES, CAL.—A contract for lighting the new district of East Hollywood has been awarded to the Pacific Light & Power Co. by the Board of Supervisors. The company's bid was $4300 for a period of five years.

WATERWORKS.

VALE, ORE.—The City Council has granted a franchise to C. Carter for a water system for Vale.

TACOMA, WASH.—The City Council has given notice of the construction of water mains in Grant avenue and other streets.

COLUSA, CAL.—Bids will be received by the City Council for the construction of waterworks. The bids will be opened on October 25th.

CHINO, CAL.—The Chino Water Co. has sold some of its shares and the money realized will be used to develop more water for irrigation and other purposes.

ALAMEDA, CAL.—The Nevada Machinery & Supply Co. has been awarded the contract for installing an underground water system in Lincoln Park, at a cost of $800.

OAKESDALE, WASH.—The City Council has passed an ordinance providing for an election to vote on a system of water works at a cost of $11,000, and the issuance of bonds to pay for the installation.

COLVILLE, WASH.—W. W. Tilghman, W. C. Goss, N. J. La Plant and F. A. Wilson of Marcus, Wash., have applied to the county commissioners for a franchise to install a system of water works in that town.

THE NOVAK REVOLVING DIFFUSER FOR CENTRIFUGAL PUMPS.

[Continued from page 320]

gallons per minute. The pump was belted to a 13 h. p. D. C. motor. The pump discharged the water through a pipe of about eight feet length at the end of which was an elbow pointing downwards fitted with a calibrated and adjustable discharge nozzle. However, in addition a Francis overfall weir has been used, and the values found with the same, which were somewhat lower than those found with the nozzle, have been entered into the table of the test report. All the gauges and instruments were carefully tested. The electrical measurements as well as the motor efficiency test were made in the most perfect manner with instruments of highest accuracy.

In the columns marked "F" the diffuser was held "fast" by inserting a specially provided pin; for the other tests marked "R" the Novak diffusor was permitted to revolve freely.

The difference of efficiencies of about 20 per cent between the tests with the revolving diffuser and with the fast diffuser is very remarkable. Comparing the tests No. 6 with No. 9 and No. 7 with No. 10, it is very interesting to see that not only capacity and lift were increased while the speed had been less, but that even the electrical input was smaller for the increased output when the diffuser was allowed to revolve.

It would take too much space also to report on another Novak pump of larger size, the tests of which have also been published in German engineering papers. Also in these tests the benefits which are gained by the Novak diffuser were fully demonstrated.

A few remarks may be welcome regarding the commercial aspects of the Novak pump. The considerable reduction of side friction and the improved whirlpool action in the Novak pump will make it possible in many cases to run the impeller at a higher rate of speed, and thus to do the work by one single runner and without sacrificing efficiency, as compared with the multistage outfit. For instance, one runner with Novak diffusor will replace a four-stage turbine pump running at half speed. Such a single runner, which may even require a casing of considerable radial extension if it is surrounded by several Novak diffusors, connected with a motor running at higher speed will therefore be a very strong competitor of the slower speed (or even equal speed) multistage turbine pump. Thus it will be possible to build pump units comprising higher speed steam turbines designed for the most favorable conditions of steam consumption, and such units will benefit also in the latter direction.

The tabulated test results would indicate that a very strong standard line of house pumps can be developed to give high efficiency with a low priced outfit, able to compete with triplex pumps in regard to efficiency as the latter require a number of gears between the crank shaft and a lower speed electric motor.

Higher pressure will go in hand with large volumes of discharge. Fire protection systems, high lift pumping propositions such as in mines, from 100 to 300 pounds pressure will certainly offer large opportunities for the Novak pumps.

Fig. 2 will indicate that the Novak pumps can be standardized conveniently in as much as even a considerable deviation from the regular standard runner diameter can be taken care of by a slight alteration to the first revolving diffuser, thus adapting the pump to larger or smaller lifts.